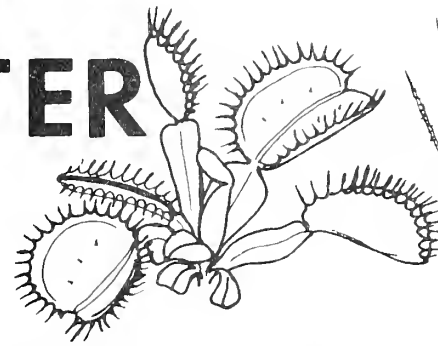
CARNIVOROUS PLANT NEWSLETTER



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CO-EDITORS: D. E. SCHNELL, RT. 4, BOX 275B, STATESVILLE, NC 28677
J. A. MAZRIMAS, 329 HELEN WAY, LIVERMORE, CAL. 94550

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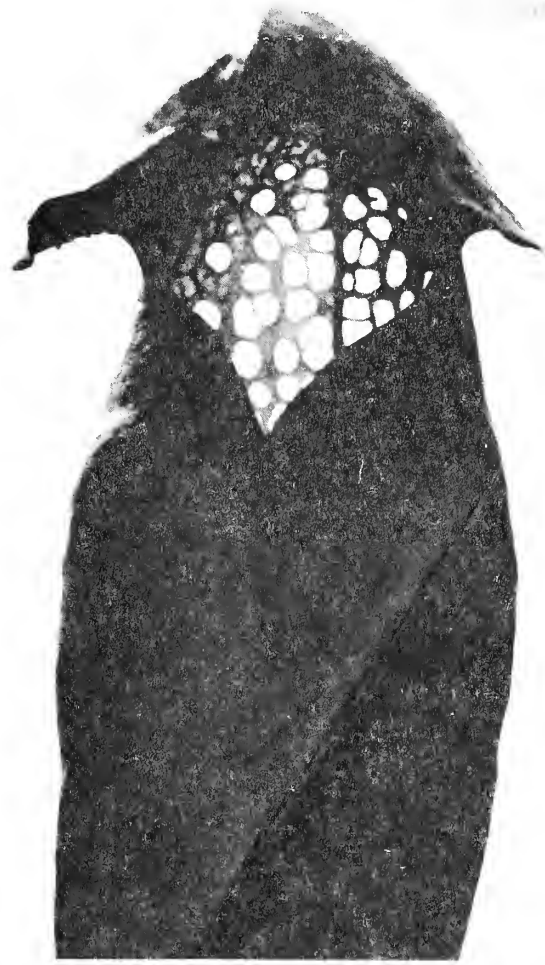
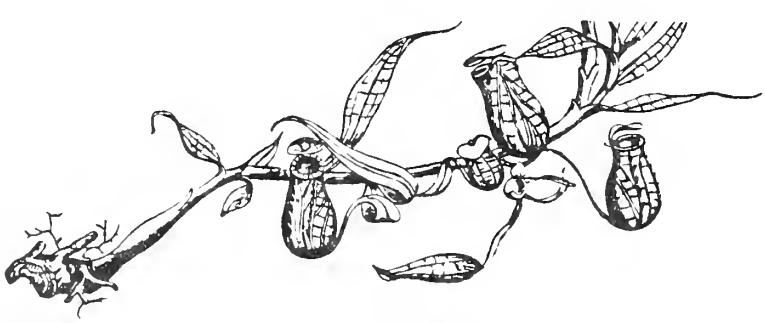
CHRYSAMPHORA CALIFORNICA



SARRACENIA MINOR

NEW SUBSCRIBERS

JOHN YOUGER (117 King Avenue, Columbus, Ohio 43201).
WILLIAM J. KOCH (Botany Department, University of North Carolina, Chapel Hill, N. C. 27514) is a mycologist.
STEPHEN ROSE (210 Weaponess Road, Wembly Downs, Western Australia 6019).
SHUNSUKE TANAKA (1-1-16, Mikagehon-Machi, Higashinada-Ku, Kobe City, Hyogo Pref. 658, Japan).
IKUWO BABA (3-2-17-715, Satonaka-Cho, Nishinomiya City, Hyogo Pref. 663, Japan).
KATSUYUKI TAKEDA (7-20, Koshien-Ichiban-Cho, Nishinomiya City, Hyogo Pref. 663, Japan).
DR. EDGAR T. WHERRY (41 W. Allens Lane, Philadelphia, Pa. 19119) hardly needs introduction to our readers, his work and papers on Sarracenia being recognized classics.
PETER D. VAN DER GIESSEN (27 Ormond Street, Paddington, N.S.W. Australia 2021).
CHARLES L. KLINE (5701 Rutgers Road, La Jolla, California 92037) is now horticulturist at Sea World in San Diego. He has the responsibility of handling the difficult job of maintaining the plants over this vast area. Among his innovations is to plan a public display of carnivorous plants. We hope that such a display will be very successful.
DR. E. A. SCHELPE (Bolus Herbarium, University of Capetown, Rondebosch, C.P., South Africa).
BARRY HANCOCK (28 Truman Street, South Kingville, Victoria, 3015 Australia).
ROBERT R. ZIEMER (840 Fickle Hill Road, Arcata, California 95521 See News and Views.).
DR. WADE L. BERRY (Los Angeles State & Co. Arboretum, 301 North Baldwin, Arcadia, California 91006).
NOEL H. HURD (1515 1/2 Milvia Street, Berkeley, California 94709). "My interests in plants include raising Bonsai (at this point I have over a hundred trees), mushroom hunting, and raising plants under artificial lights (including house plants and cacti). I also like to raise hard-to-grow or rare plants. As far as carnivorous plants are concerned, I am growing fly-traps, pitcher plants, sundews and cobra lily with hopes of trying more if possible."
JAMES N. CATANIA (299 Cole Street, Apt. 2, San Francisco, California 94117).
JERRY VAN SAMBEEK (Box 1137 Biology Department, Washington University, St. Louis, Missouri 63130).
JAMES CARNES (1627 Birney Street, Saginaw, Michigan 48602).
JAMES E. DOTY (Los Angeles State & Co. Arboretum, 301 North Baldwin, Arcadia, California 91006).



NEWS AND VIEWS

ROBERT R. ZIEMER writes: "My interest in insectivorous plants goes back fourteen years when I purchased three bulbs of Dionaea from a dime store. These flourished, divided, flowered and set seed in my house in Berkeley. I was successful in germinating the seed and growing small plants. The original plants have moved with me to the fog of San Francisco, the deep snows of Donner summit (Cal.), to Colorado, and then to the rains of the Redwood region. My main interest is learning to grow and reproduce all types of insectivorous plants. My collection to date is limited to those I have found or which others have been kind enough to give me. I built a small greenhouse (11 x 16 ft.) last summer and now for the first time have some room to work in. My education and occupation is forestry, hydrology, and plant physiology. I like to observe plants in their native habitat whenever possible and am always interested in location maps of plant distribution. The recent literature on insectivorous plants is quite meagre and I look forward with excitement to reading my first issues of CPN."

JOE MAZRIMAS advises that the buffer salts solution for growing Aldrovanda as mentioned in the short note in the last issue, must be prepared by dissolving the salts in order and each one completely before adding the succeeding one. Also, preparation of a 25 fold concentrate with subsequent proper dilution will help prevent insoluble precipitates from forming.

Joe has also had some good results with vegetative propagation of Pinguicula: "I propagate Pinguicula from leaf cuttings by carefully peeling the leaf off the bulb and inserting it in loosely packed bunch of live Sphagnum moss in a four inch pot. I set the leaves in a row with the narrow end about one-fourth inch into the moss and the rest laying flat pressed to the surface. I insert the label in the center and water very lightly and place a baggie over the whole thing and place in a spot where the temperature is about 60-65° and a brightly lighted area. No more watering is necessary, in fact it is detrimental and rots the leaf before it has a chance to initiate a bud. If the leaf rots, it means usually that the medium is too moist. Leave the pot as is until you see five to six new leaves coming out of each narrow end which means it is well rooted. Then they can be carefully separated if necessary into other pots."

STEVE CLEMESHA has also had some success using similar methods in propagating Pinguicula. Steve also has some more Cephalotus information, salty and otherwise: "A chap collected a Cephalotus plant in a sod of soil and found that it contained ten times the normal amount of salt as average soil and so he got some special "salty" peat to grow it in. There was no reference to giving it more salt afterwards, and I think that the salt would soon have been leached out. My opinion is that this plant tolerates salt but does not benefit from it. My plants grow well here and flower freely each year. The plants alsc increase quite well though they do not seem to make the

long underground rhizomes they do in nature. I think it is not a fast growing species. Where it grows, the winter rest is quite long so by the time it sends up its spring crop of flat leaves and flowers, it only leaves a fairly short time to form pitchers. Here in Australia, it grows from August to April or May."

BRIAN WHITEHEAD writes that he found that Cephalotus seeds will also germinate on dead Sphagnum as well. The name of the German peat mentioned in a previous article of his was "Flocino". He believes any fairly hard peat would be okay (without a lot of decaying matter). His Cephalotus grow well, most producing three to four flower stalks per pot each year for the last three years.

CRAIG GEE has sent us this note: "I am a twelve-year-old boy very interested in carnivorous plants. I had much success in growing Dionaea from rhizomes and seeds, and I am interested in Australian Droseras and Cephalotus. Currently, I have several Sarracenias and some Droseras including many that I grew from seed. I have noticed that when Dionaea rhizomes are grown under lamp light, they will produce long leggy leaves and hook-shaped traps. When grown in sunlight or under Gro-lux light, the leaves will have a healthy shape and color. I like to grow these bulbs in well drained containers using pebbles for drainage and some well saturated "Canadian sphagnum peat moss" on top. Some fresh Sphagnum laid on this helps to keep the peat moist as well as prevents erosion of the surface peat. I have applied gibberellic acid on three Dionaeas and the result was very long hanging leaves, the traps were no bigger, and soon the plants were a gross sight and ruined. Some reliable sources for Dionaea bulbs were Armstrong Associates and Insectivorous Botanical Garden. For addresses see CPN Vol. I, No. 2, page 25."

We mentioned some books in the last CPN and would like to add some older ones to the list:

Adolf Wagner: The Insectivorous Plants 1911 128 pages
Otto Rosenberg: Physiol-cytological Studies on D. Rotundifolia 1899 126 pages
M. Darwin: Insectivorous Plants 1875
C. Darwin: Insectivorous Plants 1896 462 pages
M. Walcott: North American Pitcher Plants 1935 (with notes by Edgar T. Wherry and Frank Morton Jones)

MRS. R. E. STAUFFER (353 Oakridge Drive, Rochester, NY 14617) and THE NATURE CONSERVANCY (1800 North Kent Street, Suite 800, Arlington, Va. 22209) are attempting to find ways of preserving the area on the Alabama-Mississippi line along US 90. This area abounds in Sarracenias in great concentration. These people are also interested in looking at other areas along the Gulf Coast and are meeting on the state line at 10:00 a.m. on April 4. We presume they would like to have all those interested and able to help or make suggestions join them, or write either of the above.

SHORT NOTES

FIELD OBSERVATIONS ON SARRACENIA

by Allan D. Marmelstein

The following represents casual relationships observed during two days of intensive collecting in contiguous areas of southern Mississippi and Alabama. No originality is claimed as it is quite likely that others have seen, and probably published, the obvious features of Sarracenia populations in this region. Specifically, the area covered lies along the Gulf Coast from Ocean Springs, Mississippi to Mobile Bay, and inland to just beyond Interstate 10. The discussion will begin with species and conclude with hybrids.

Sarracenia alata

In the area specified, this appears to be the most abundant species. This spring has been dry for the Gulf Coast, but that fact notwithstanding, S. alata seems to occur in dryer habitats than the other species observed. It is extremely plastic in vegetative expression. One notable population is apparently centered near Ocean Springs. In addition to the red venation characteristic of the species, plants from this population, found intermixed but not intergrading with the "usual" S. alata, have the underside of the lid and the inside of the neck completely suffused with red. The effect of the red interior and the bright yellow exterior is most striking, making these plants stand out from their habitat associates even when observing along a highway from a car going 70 m.p.h. The plant rivals S. leucophylla for beauty, especially on first observation in the field. S. alata was found growing variously with S. psittacina, S. leucophylla and S. purpurea.

S. leucophylla

This species in the area described grows almost entirely in Alabama. Along U.S. 90, it occurs in roadside meadows beginning just west of the Alabama-Mississippi state line, then sporadically eastward. It occurs in several places in large stands of several acres or more - an incredible sight when new leaves are just opening in coincidence with flowering. Two distinct varieties were observed, although intergrades were equally frequent. One variety has a great deal of white on the upper tube, and the lid is entirely white, although both areas have few narrow red veins. From a distance, this plant appears solid white. The other type has less white, more red veins, and the latter color frequently suffuses into the hood. From a distance this type has a reddish appearance and is easily distinguished from the other. S. leucophylla was found growing variously with S. alata, S. psittacina and S. purpurea. It occurred most frequently with the first two and was never observed growing alone, as was S. alata.

S. psittacina

This species is quite common in the wetter fields and meadows, but is the most difficult to find due to its growth habit. Occurrence of flowers considerably shortens the search. Due to its low growth habit it appears most vulnerable to fire exclusion and most populations

located appeared in danger of extirpation due to competing overgrowth.

S. purpurea

This species appeared to be the least common in the area described. All located populations were in disturbed areas such as roadside ditches or along dirt tracks through wet meadows. It was generally found growing alone in small populations, near but not mixed with S. alata or S. leucophylla. Surprisingly, it was not found with S. psittacina, although both showed a preference for the wettest habitats.

Hybrids

All five of the natural hybrids reported for the area were located. Where they occurred together S. alata and S. leucophylla invariably crossed so that S. alata x S. leucophylla was veryeasy to find. Complex back crosses were also evident, though less frequent. Perhaps the most striking single plant observed was a four foot high cross which is probably (S. alata x S. leucophylla) x S. leucophylla. It had the broadened tube of S. alata and a similar hood, but the coloration was S. leucophylla. Further, the hood was scalloped as is S. leucophylla. Hybrids of S. purpurea x S. alata and S. leucophylla were also fairly common, although most frequent in populations of the tubular parent. They were rarely found with S. purpurea. Indeed, both hybrids were usually found in amongst the tubular parent in localities where S. purpurea was considerably removed or not apparent. In at least two cases, an intense search for S. purpurea was made, to no avail.

Crosses of the tubular species with S. psittacina were least common of those observed, although S. psittacina could usually be found with either S. alata or S. leucophylla.

All of the S. psittacina x S. alata and S. psittacina x S. leucophylla were found in disturbed areas growing with S. psittacina. None were found with the tubular parent. S. psittacina hybrids are among the most unusual and beautiful of the genus.

Specimens of all plants mentioned were obtained and may be observed in the collections of J. A. Mazrimas as well as the author. All hybrid identifications are tentative and based on a best guess according to available parents. In the case of S. alata x S. purpurea and S. alata x S. psittacina, identification is probably absolute, as S. alata was the only tubular plant growing in the area or observed for many miles in any direction.

VISITING BOGS IN THE EAST AND WEST

by Richard Sivertsen

In the spring of 1970, I was stationed at Keesler AFB in Biloxi, Mississippi. I noticed that as I drove inland on Highway 90 and approached the woods and meadow country, I saw many plants with bright, tall yellow flowers everywhere, looking like giant dandelions. They practically lit up the entire way, from Ocean Springs to inland about twenty miles.

Later, I became acquainted with the base agronomist, Mr. Wilson, who

showed me a large meadow in the back of his home. This meadow had been dominated by tall pines but now most of them were burned down due to a bolt of lightning. Tall red flava-like pitcher plants now dominated the entire field of about four acres. As I looked through the towering three to four foot tall pitchers, I could see S. rubra, S. psittacina, Drosera rotundifolia, D. intermedia, D. filiformia var. tracyi and D. leucantha that grew in scrolls about three feet long and very bushy. Also there were numerous orchids with flowers ranging from blue-violet to yellow, red and pink. The natives here call these red-veined pitcher plants (S. alata) "butter-cups" because their flowers look just like a round cup overflowing with butter-like petals on five sides. The smaller pitcher plants, the parrot pitcher (S. psittacina) were sometimes called "blood-cups" because of the red petals. The D. filiformis var. tracyi sent up long flower stalks with about five to nine flowers on a four foot stem. The flowers were a dark violet purple.

At another time, I went to another burned field to look for other species of Sarracenia and came to a roadside dirt or mud bank about three to four feet tall. All over this bank grew tiny Drosera no larger than the size of a dime with tiny flower stalks. However, I didn't find any other species of Sarracenia other than the ones in Mr. Wilson's field. I was surprised to find a tall hybrid of S. alata and S. psittacina which had white spots on the top like S. psittacina but grew diagonally. It seemed that the hole where insects enter was very well hidden from view and I wondered if it was ever open to allow insects to be trapped.

I collected specimens for various botanical gardens. The root stocks and rhizomes of some of the tall S. alata plants took some long hours of work to dig up. One I remember was so long that with an original intention of not breaking the rhizome, I gave up and broke it at about fourteen inches in length. I still don't know how long the original rhizome might have been. The soil was clay mixed with very fine silica sand.

It was extremely difficult to distinguish the S. rubra species from the other tall, vertical pitchers. At first I thought both were the same species and size was the only difference. However, the flowers were different and the shape of the pitchers was slightly different. Evidently, I saw hybrids between the tall pitchered plants and S. rubra. Some grew to about three feet while S. rubra grew only to about nine inches. No pitcher plants grew in any "perpetual puddles" in this meadow (as the D. rotundifolia and D. intermedia did) but instead grew on higher ground above the puddles.

When I went up to "Pine Barrens" on the New Jersey coast, I stopped by Bass River Forest. I walked only about fifty yards from the office to the bridge and under that bridge were thousands of S. purpurea growing all over in a series of ponds with a stream running through. They grew right in the water with their roots, rhizomes and most of their leaves under water, tangled up in Utricularia.

On the banks were bogs of Sphagnum moss with little holes in them. The holes were the openings to the pitchers of S. purpurea. The ones

that grew in the pond were elongated, dark purple-maroon red, with long stringy rhizomes. The rhizomes would float near to the water surface and then bear about three to six buds of new sprouts (depending on how long the rhizomes were). Some rhizomes showed about a two to three inch growth between leaves. The pitchers were huge and elongated and could easily hold over a pint to almost a quart of water. I received special permission to collect a few specimens. It was extremely easy collecting those from the water. Most of the plant could be lifted by placing my hand under and giving a gentle pull.

Along the lake of Bass River, D. intermedia dominated much of the bank. It grew everywhere--underwater, or floating on driftwood, wet rocks, tree stumps filled with water. However, a few banks had some D. filiformis that were about six to ten inches high growing in a well drained Sphagnum moss-topped sandy bank.

Jumping across the country to visit friends and relatives on the west coast, I set out to search for Darlingtonia plants in northern California. In Gasquet, I saw several small rocky streams of cold spring water trickling through rocks and in between were the tall pitchers of Darlingtonia. These few plants grew in almost no soil at all, as they just rooted themselves in between the rocks and stones of the stream and grew contently with just the fresh, cool spring mountain water. They seem to love the mountain springs and meadows. Unlike the Sarracenia that have their pitchers facing each other like a football huddle, the Darlingtonia's pitchers twist 180° as they grow so that all the pitchers of one plant have their backs to each other. This gives each pitcher a greater range of scope for insects. They prefer direct sunlight from the northeast for a few morning hours. Almost always, there will be running water trickling through the meadows where they grow.

It is interesting to compare the translucent spots of Darlingtonia and S. minor and a few others. The translucent spots on the hood appear as holes to the insect as their eyes see images rather than defined objects. So they have no fear of crawling inside. The "tongue" of Darlingtonia is the "red carpet of doom" tempting the victim right inside the hood. Although Darlingtonia pitchers get quite large, I found mostly small insects in the pitcher such as beetles and ants. The hood prevents any rain from entering so it can be assumed that the digestive liquid has been secreted by the walls of this pitcher. The hole curves inward so once an ant enters the hood and tries to walk out, it will find itself walking upside down with unsure footing and soon falls into the fluid below. The long, stiff hairs pointing downward prevent escape. A waxy coating further up the pitcher causes the insect to lose its grip and fall into the fluid which soon digests it.

Darlingtonia pitchers grew tall, up to four feet, had strong, tough walls for support in the breezes. The best location for these plants that I've found is around Clair Lake, near Redding, California. Take Route 3 from Weaverville, then past Mule Creek until a sign says Lake Eleanor Trail. It is advisable to pick up a map at the Mule

Creek Ranger Station. Follow it carefully until the road ends. Then walk out of your car to the lake. The pitcher plants should be quite visible. They grow all along the road that leads to the trail, on the left side. Extensive bulldozing is going on in this area and probably there are several Darlingtonia bogs being torn out to make way for lakeside campsites.

(ED. NOTE: Dr. Edgar T. Wherry has recently become a subscriber to CPN, and after reading the first three issues, he sent us the following comments in the form of three little essays.)

Essay 1. CORRECTION

Introductory sheet, end of paragraph 3. The expression "carnivorous botanists" is inappropriate, for some of your readers may be vegetarians. The correct wording should be carnivore botanists, meaning people who study carnivorous plants.

Essay 2. HANDS-ACROSS-THE-SEA

Some fifty years ago, as a native-plant-explorer for the U. S. Department of Agriculture, I collected plants and wrote text and key for Mrs. Walcott's work, Illustrations of American Pitcher Plants published by the Smithsonian Institution. Becoming thus known as something of an authority on these plants, I received considerable correspondence; especially interesting was that from Mr. T. Saito of Japan. One summer I attended the convention of the American Institute of Biological Sciences at Columbus, Ohio, and there was approached by a young Japanese student, who introduced himself as Katsuhiko Kondo, who told me that his period of study at the University of North Carolina was financed by my correspondent Saito, who told Kondo while in the U. S. to be sure and visit Philadelphia and get acquainted with me - and behold, he merely had to walk across a room.

Essay 3. LUMPING VS. SPLITTING

It seems desirable for the benefit of readers who are not professional taxonomists to enlarge on the classification of these folks as "lumpers" versus "splitters," with especial reference to a conservation problem. In Vol. I, No. 1, p. 15, there is a book review referring to a case of contrasting views: careful students of Australian Nepenthes had, as splitters, recognized eight species. But the author, decidedly a lumper, reduces them all to one.

Some years ago I discovered near Flat Rock, North Carolina, a spectacularly showy pitcher plant, and duly named it Sarracenia jonesii. Its pitchers, borne singly or in very small numbers, were rather well covered by an arching hood and its large flowers had deep red petals. Growing in open grassland, it could easily be found by prospective pollinating insects, and so it had developed no fragrance to attract these. Its range proved to be chiefly in the

uplands, with some extension of an obscure variety into the Gulf lowlands. Its nearest relative was manifestly Sarracenia rubra of the Atlantic Coastal Plain; but that differed in being a relatively inconspicuous plant, with much smaller pitchers in groups and diminutive flowers. Growing in moist thickets, it might well escape the notice of pollinators had it not developed a charming rose-like fragrance.

Migrating down upland streams, when these became mountain-front cataracts, S. jonesii found the shifting sands to limit its full development, and was able to form only stunted, misshapen pitchers suggesting the inconspicuous ones of S. rubra. Naturally the lumpers seized upon this as an indication that the two species are one and the same.

The showiness of S. jonesii would make it a welcome addition to any collection, but now another problem arises--it has become very rare, indeed almost extinct. When I went back to the type meadow some years later, it had been turned into a potato field. So visits were made to another early-found locality near Etowah station. Alas, the meadows south of the station had been burned over repeatedly, and only weeds were in evidence. But a similar habitat north of the station seemed so remote that it might hopefully be less disturbed; behold, the place had been turned into a golf course. Maybe a cataract colony is still extant; or again, search by pitcher plant enthusiasts may turn up new upland localities. If it can only be transplanted to a sanctuary, like the new North Carolina Botanical Garden, it can be grown alongside its relative and their differences be worked out by the modern chemical methods coming into use by taxonomists. Only full acceptance of the splitters' approach can save one of the most striking members of the genus Sarracenia from extermination.

Edgar T. Wherry

CEPHALOTUS FROM SEED
by Brian Whitehead

Cephalotus follicularis has a reputation in its home country for being difficult to grow from seed. I have heard of attempts that produced no germination at all and others that produced germination, then failure a short time later. The plant is not widely cultivated, and although it is represented in the collections of some botanic gardens and private collections, these plants have in most cases been obtained from the field or in propagation by division.

My early attempts to raise the plants from seed failed. In May, 1969, I received some Cephalotus rhizomes collected from the field and these subsequently flowered the following summer. In 1971, while attending to some pots of Utricularia, I noticed a self-sown seedling of Cephalotus. I collected seed and the same summer sprinkled them in the same pot and on a pot with a similar medium. In the late winter of 1972, nearly all these seeds have germinated, and in

addition several others which were self sown. They all germinated on the same medium, which was commercially available German Floimo brand peat. No seeds have germinated on any other medium. I have tried to use fresh seed, sow them immediately after ripening, use peat, preferably the type named, and stand pots continuously in water to two inches deep.

The original seedling in its second season now has pitchers about one-half inch long and is doing quite well.

DROSOPHYLLUM LUSITANICUM FROM SEED
by Leo Song, Jr.

I grow Drosophyllum lusitanicum from seed and transplant the seedling (usually after two to four true leaves have grown) either into a small "liner" or directly into a one gallon container. It grows very well outside (Los Angeles) with morning sun and traps many insects in its sticky tentacles. The soil I used is composed of 50% silica sand (#20); 25% decomposed granite gravel (size between 1/8 and 1/4 in.); 25% peat moss all mixed together by volume. To each gallon of this mix, I add one level tsp. of dolomite powder. Rain water or distilled water is used to moisten for better mixing and also for watering. Another mix that Drosophyllum will also grow in is composed of 50% peat moss and 50% perlite (Sponge rock) grade #2, which being very light, is ideal for mailing small potted plants. One level teaspoon/gallon dolomite powder is also added.

I was somewhat disappointed to find that many plants die after flowering and fruiting abundantly, usually in their second year of growth, and therefore seem to be biennials. (This is contrary to many literature references. Std. Cyclopedia of Hort. and Das Pflanzenreich do not clearly state either way.) It is interesting to note that this species can take light frost (30-32° F./-1 - 0° C).

Since this species comes from coastal Portugal and Northwest Africa (Morocco) which have a climate similar to California, Drosophyllum should be grown under relatively temperate, frost-free conditions. Much of the Drosophyllum in cultivation is distributed by botanic gardens in Lisbon and Coimbra. Average temperatures for Lisbon run somewhat lower than Los Angeles and Perth. With respect to precipitation, all the above areas have a dry summer and a wet winter. Most plants native to these areas grow during the rainy season and therefore at moderately low temperatures. Therefore, Drosophyllum and many of the tuberous Australian Droseras (many from around Perth) can be grown outdoors in relatively temperate and frost-free locations (Pacific coast of California, for example). If these species must be grown under glass, it should be in a cool, well-lit house.

I noticed that Drosophyllum grew best in the spring, when the weather was cool and moist, reaching a low point in July and August when many of them died. One problem was encountered during the cool moist growing season. If rains were prolonged and the old dried leaves stayed moist, a fungus infection would often get started and spread to the stem eventually killing the entire plant. Water should therefore not be applied where the old leaves would stay moist or

accumulate in the area of the crown.

With regards to irregular germination of seed, I have tried stratification with some germination under refrigeration after about nine months, but results on total germination are as yet inconclusive. I have not tried the method recommended by Mazrimas (CPN 1:1). Seed was sown in the silica sand mix in a small flat with a screen bottom instead of the normal solid wooden bottom. Drosophyllum seedlings produce a rather long tap root which will grow through the screen bottom. The root tip dies with the resultant stimulation of secondary roots farther up. This results in a more branched root system, which is necessary for successful transplanting.

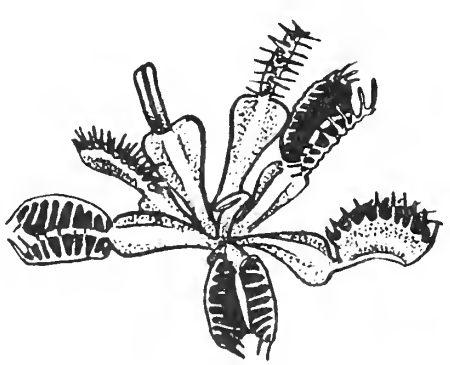
SOME TAXONOMIC PROBLEMS IN THE LENTIBULARIACEAE, ESPECIALLY UTRICULARIA. Systematic Seminar, Duke University, Durham, North Carolina. November 1, 1972.

Speaker - Katsuhiko Kondo

This is a brief summary of the above seminar. The speaker does not accept Barnhart's infragenera and Komiya's classification which is modified from Barnhart's treatment, because there are so many intermediates which are difficult to place, as well as being unnatural in most parts. Characters such as vegetative structure, leaf form, branching and so on are essentially useless in systematic treatment in the Lentibulariaceae, especially Utricularia. In Utricularia the speaker feels it is very dangerous to prepare a systematic treatment using herbarium specimens only without using living or preserved materials, because polymorphism in some species of this genus is very common and certain morphological variations of vegetative structures in species can be correlated with differences in habitats. Biosystematic studies are essential in this genus. The speaker explained two examples of biosystematic studies in Utricularia.

Experimental studies on the seedlings of Utricularia are very much lacking, especially in seed anatomy. The term "Cotyledonoids" in Utricularia was discussed. Interesting photographs of cross sections of seeds of Utricularia, which suggest seeds of Utricularia may not have either embryo or endosperm (perhaps embryo is lacking or too small to be observed), were shown.

Finally, the speaker explained natural species relationships in Utricularia studied at the chromosome level.



RECENT LITERATURE

Duddington, C. L., Wyborn, C.H.E.: Recent Research on the Nematophagous Hyphomycetes. Bot. Rev., 38: 545-565. 1972.

This is a brief summary paper updating research in the neglected area of carnivorous fungi since the author's 1955 paper. There is a brief review of the trap types and mechanisms with generic examples mentioned, followed by recent advances in the studies of trap formation stimuli, nutritional studies, toxins, ecology and discussion of application to biological control of nematodes. Endozoic parasites are updated in a long section. There is a valuable, rather complete bibliography.

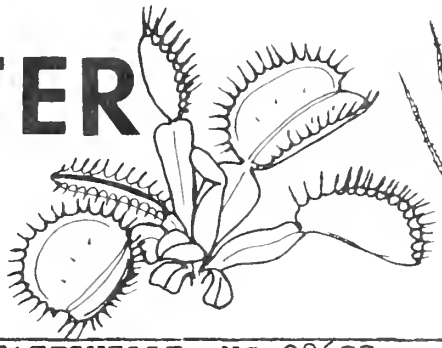
Kondo, K., Whitehead, B.: The Chromosome Number of Utricularia dichotoma. Chromo. Inf. Serv., No. 13, p. 6-7. 1972.

Pollen mother-cell counts in this species were n=14, these results being available for the first time and add to the data concerning the question of whether Barnhart's segregation of the genera in Lentibulariaceae is legitimate.

Kondo, K., Whitehead, B.: The Chromosome Numbers of Utricularia dichotoma var. uniflora and U. lateriflora. Phyton, 29 (1/2), p. 95-98. 1972.

The chromosome numbers of these species (n=28 and n=14 respectively) are reported for the first time.

CARNIVOROUS PLANT NEWSLETTER



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CO-EDITORS: D.E. SCHNELL, RT. 4, BOX 275B, STATESVILLE, NC 28677
J.A. MAZRIMAS, 329 HELEN WAY, LIVERMORE, CALIF. 94550

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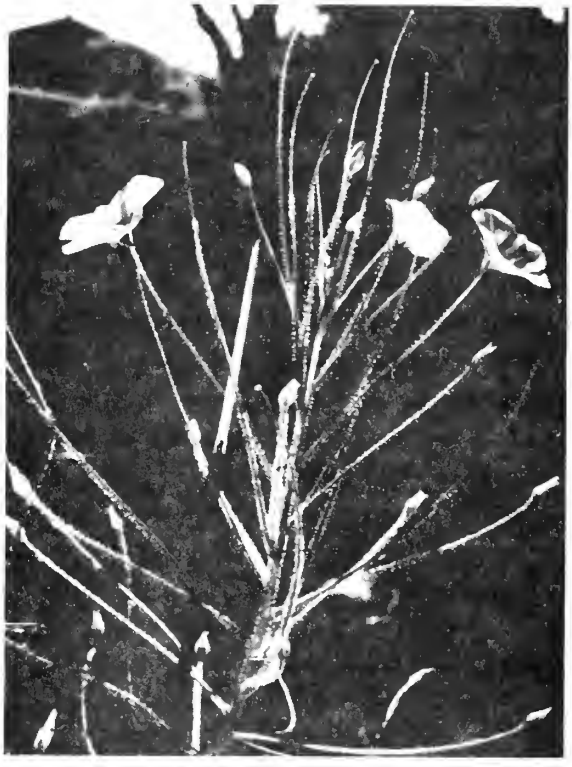
BYBLIS LINIFOLIA



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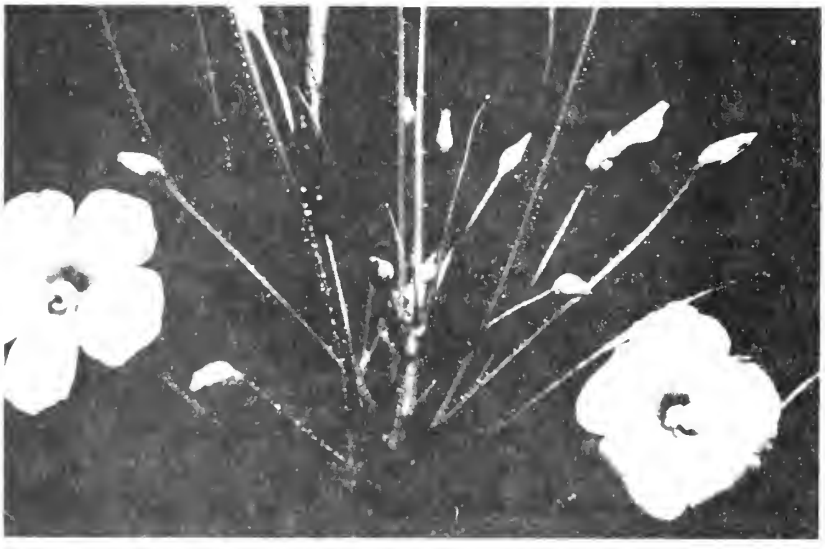

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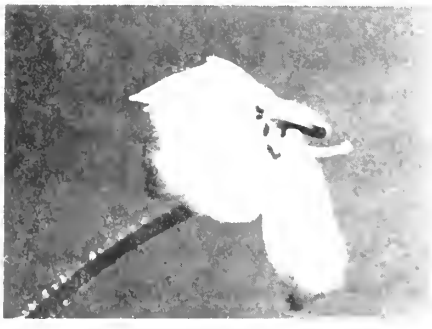

BYBLIS GIGANTEA

NEW SUBSCRIBERS

ARNE RØSVIK (Ringve Botanical Gardens, University of Trondheim, Ringve, 7000, Trondheim, Norway) is the newly designated director of the botanical gardens. Richard Sivertsen informs us he sent him an authentic pair of American spurs so he could properly ride his donkey through the mountains while botanizing.
ELIZABETH M. WOODFORD (Cedar Run Lake, Marlton, New Jersey 08053) is a naturalist, writer, photographer and lecturer who lives on a large estate with natural bogs containing native and naturalized carnivorous plants.
SHOJI TSUCHIYA (7-33 Seumatsu, Nonoichi-Machi, Ishikawa-Gun, Ishikawa Pref. 921, Japan).
RYUSHI HARADA (1-39-4, Suwa-Cho, Kigashimurayama-Shi, Tokyo 189, Japan).
STEPHEN TIM (Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, New York 11225) has just joined the Garden and is interested in building up a collection of carnivorous plants.
AARON J. SHARP (Dept. of Botany, University of Tennessee, Knoxville, Tennessee 37916).
DAVE HANNINGS (Dept. of Floriculture and Orn. Hort., Cornell University, Ithaca, New York 14850).
THOMAS J. PICCO (170 Mill Road, Staten Island, New York 10306).
MIMI CRAINE (109 Orchard Place, Ithaca, New York 14850).
J. BOGNER (Botanischer Garten, Menzinger Str. 63, 8 Munchen 19, West Germany).
KEN MOORE (Dept. of Botany, University of North Carolina, Chapel Hill, N. C. 27514) manages the NC Botanical Garden in Chapel Hill under the directorship of Ritchie Bell. The garden is conserving native plants, and of course this includes various carnivorous species.
DR. MICHAEL WIRTH (Division of Natural Science, New England College, Henniker, New Hampshire 03242).
DIANE SPRIGGS (2351 NW 102 St., Miami, Florida 33147).
BILL BARNETT (P. O. Box 763, Clarksburg, West Virginia 26301).
PATRICIA A. FLISS (Dept. of GDP, Cornell University, Ithaca, N.Y. 14850).
JOHN H. HNATOW (Box 112, Schwan's, 1871 Hanshaw Road, Ithaca, New York 14850).
REGINALDO BRITO (Caixa Postal 1638-ZC-00, Rio de Janeiro, Guanabara, Brazil) is growing a limited number of species of carnivorous plants in an apartment and would like to have more information as well as exchange ideas.
DANNY W. BIRCH (72 Lakeshore Circle, Sacramento, California 95831).
SHELDON ARKIN (P. O. Box 775, Arcata, California 95521).
DR. H. WANDERKA (P. O. Box 1453, Mannheimer Str. 83A, Viernheim 6806 Germany).
MARCEL LECOUFLE (5, Rue de Paris, 5, 94470-Boissy-St. Leger, France) is a noted grower of orchids and other tropical plants and has successfully grown a large collection of Nepenthes and their hybrids and sells rooted cuttings of these to many collectors throughout the world.
RAY COLLETT (Crown College, University of California, Santa Cruz, California 95064).
STEPHEN MALIS (1671 Oakdale Street, Pasadena, California 91106).

ROBERT E. ENGEL (Department of Biol. Sci., UCSB, Santa Barbara, California 93106). "I have been bitten by the bug. I am now growing several species of Drosera, several Dionaea, and some Darlingtonia. I do not have any greenhouse facilities, and therefore all my plants are being grown inside with the help of fluorescent light. I am not a botanist by trade (rather an animal behaviorist), but am becoming fascinated with several aspects of botany--epiphytic plants and carnivorous plants."
TOM SHINN (Route 1, Box 321A, Leicester, North Carolina 28748).
HUGH N. MOZINGO (Box 8041, Reno, Nevada 89507) NEW ADDRESS
PETER PAULS NURSERIES (Route 4, Canandaigua, New York 14424).
JOHN J. GLENNON (Route 1, Box 231, Eureka, California 95501). "I've been interested in carnivorous plants for the past five years and have had quite good luck growing these plants. I have germinated seeds of Nepenthes and the seedlings are still in the cotyledon stage. I also have had good luck in growing S. minor and S. purpurea from seed. I am a botany major at California State University at Humboldt and have my own greenhouse."
CHRIS OSTROM (315 Anderson Street, Tallahassee, Florida 32303) is an oceanography student at Florida State University and is a plant freak.
JONATHAN M. LOYO (606 E. 7th Street, Pomona, California 91766).
ACQUISITIONS DIVISION (Albert R. Mann Library, Ithaca, New York 14850).
MICHAEL DERTHICK (Apt. 2, 1895 "H" St., Arcata, California 95521).

NEWS AND VIEWS

STEPHEN ROSE visited an Australian Cephalotus station recently and sent these notes: "In the upper Hay River district, the plants grow in abundance over a small area. It was on the banks of a waterhole used by cattle; the bank was seeping water. The Cephalotus were sometimes covered by water. The amazing thing about them was that the cattle had regularly walked over them and broken up the rootstocks, thereby increasing their numbers until they simply smothered the ground. Most of them grew through deep moss two inches thick and in full sun. There were some beautifully colored pitchers, but these were smaller than those under shrubs. One factor I did notice was that good-sized plants had grown from quite small pieces of rootstock. Old rootstock is very dark and tended to be more rotten than the younger and almost white rootstock. Although both types of rootstock did have surface plants, the younger rootstock seemed to possess larger plants of greater vitality. Their rootstocks, even in undisturbed ground, were all intertwined. Some plants had grown from old red rootstock some six inches below the surface and possessed rather spindly rootstock. Some plants, usually larger, had their rootstocks within an immediate three or fewer inches below the surface. Another interesting fact is that quite a number of rootstocks possessed young growing buds, when these plants are normally ready to die back fairly soon (late summer). I have never grown them myself but those I have seen are in original soil. These plants grow in ground that ranged from peaty sand to peat to mud-peat. Most grew in mud-peat and at surface water level. The others had very deep rootstocks and were very miserable specimens. The soil temperature was about 70° F. or a little less, on a day that was over 85° F."

GEORGE JOHNSON sends us a note on a new publication which will appear about February 15th called the "1973 Tender Plant Finder" which will list horticultural sources for all sorts of interesting plants. Among these will be listed the sources of carnivorous plants. The 36 page book which costs $2.25 can be purchased from HHH Horticultural, 68 Brooktree Road, Hightstown, New Jersey 08520.

BOB ZIEMER writes that John Harshberger followed up his original observation on the inflorescence of Dionaea in 1892 by another paper written in 1907 in the Botanical Gazette. In this paper, Harshberger placed the tiny plantlets in a sand bed and found that they grew perfectly and rapidly and were normal in structure. Thus, he concludes that Dionaea can reproduce itself vegetatively by this means.

RICH SIVERTSEN sends in his new address which is: 310 South 9th St., Plattsmouth, Nebraska 68048. He also goes on to say that using four 40 watt WIDE-SPECTRUM Gro-Lux fluorescent lamps, he has no trouble getting plants to turn red. Many of his Droseras are entirely red in color. The inside of Dionaea traps are also brilliantly red. He observes that even his Cephalotus pitchers turn red and all plants grow rapidly, are well proportioned and none grow etiolated.

DON SCHNELL at last is able to report some good luck with finding pollen in greenhouse grown Heliamphora heterodoxa. The plants are becoming quite adapted and mature and seemed to bloom continuously all winter, but no pollen was ever demonstrated during these months. However, after a recent two weeks of very damp and misty weather followed by several days of full sun and unseasonably warm temperatures, he was checking anthers as usual--the checks having become more ritual than anything else--when after flicking the anthers of some rather overmature flowers, a fine shower of pollen was seen. The stigmata of these flowers were brown, so he doubts if attempts at self-pollination will be fruitful. But pollen was applied to green, sticky stigmata of fresher flowers, these having soft, moist, immature anthers. A cotton blue-lactophenol stain demonstrated only about 10% likelihood of viability, but mass-pollination may overcome this. Nothing special was done or seemed to happen to these plants which were growing as usual in full sunlight exposure in very moist Sphagnum tubs, so what is behind the sudden appearance of pollen is a complete mystery at this time. He will watch eagerly for the appearance of seed and the opportunity for additional pollination.

GIFFORD SUN recently paid a visit to Taiwan: "On August 7, 1972, my family and I headed for Taiwan on a search for insectivorous plants. My first encounter with them was in Yangming Shan Park, north of Taipei. Here I found two locations of the species, Drosera spathulata (diploid). I located the first colony directly in the park growing on a steep hill covered with moss. The plants were rather green with hardly any or no coloration growing straight up through the surrounding vegetation. Here the area was very wet with humidity about 70% and temperature about 80° F. The other location was about one-eighth of a mile away. Here the plants were growing on a hill but in direct sunlight. The plants were more deeply colored and had abundant blooms.

There was less water feeding the plants which made the soil hard with hardly any moss growing. A small trickle was seen coming down the hill. The healthier plants were growing at the top of the hill where no one could get to them.

"The next stop was in the Marble Mountains, west of the city of Hualien. After a careful search, I was able to find Utricularia. This plant grew in a similar condition as D. spathulata except there was much more water flowing and more moss growing. Utricularia plants were growing everywhere for a distance of about twenty miles. It was a cloudy day with the humidity about 50% and temperature about 70° F."

JOE MAZRIMAS has outlined two varieties of Pinguicula vulgaris. "According to a study made by Eric Hulten in his book "Flora of the Aleutian Islands", there are two varieties of P. vulgaris which are distinguishable by their flora. The variety macroceras is much more common and possesses flowers 24 mm. long with large, broad, rounded lobes suddenly narrowing to a long filiform blunt spur up to 32 mm. long.

"The other variety, microceras has conical flowers about 16 mm. long merging into a small acute conical spur. This variety is less common in both the Aleutian area as well as the Scandinavian countries. In some localities, all the intermediates can be found between the two extremes. There are no other differences between the two types as they merge into each other."

ALLAN MARMELSTEIN has been growing carnivorous plants under lights: "Just a short note in response to an item in the latest CPN (Vol. 1, No. 4). I have been growing various species under fluorescent lights for some years. At home I have what amounts to a portable hothouse for coping with humidity requirements in a dry apartment. It is a plywood container 4 ft. by 2 ft. supported by an "A" frame at the apex of which is a 4-tube, 4 ft. fluorescent fixture. The growing chamber is enclosed in plastic sheeting (the clear type used in construction) and the plywood box has been fiberglassed. I use 40 W deluxe warm white tubes placed about 3 ft. above the base of the box. I am successfully growing various Nepenthes, Cephalotus, all domestic Sarracenia, Heliamphora, and various Drosera. All grow and develop normal color except domestic Drosera. They seem to require considerably more light than such species as D. binata, D. dichotoma, D. spathulata, D. capensis, etc. At the Brookside Botanical Garden near my home I have created a display in a large terrarium (using a one hundred gallon all glass aquarium). The dimensions of this tank are 6 ft. by 18 inches by 18 inches. The terrarium is in an unlit hallway, but is topped by a 4-tube, 6 ft. fluorescent fixture fitted with four very high output grow-lux tubes. In this display, which, incidentally, I feel should be duplicated at other botanical gardens where carnivorous plants are either lacking or not well displayed, we have a dozen or more Dionaea, D. capillaris, all the foreign Drosera listed above, Pinguicula (P. lutea, P. ionantha, P. planifolia), Cephalotus, Nepenthes gracilis, and various Sarracenia. All, including the domestic Drosera, develop full coloration. This terrarium has been established and the plants growing for over eighteen months. In

fact, I have had to prune and discard D. binata several times to keep it from taking over. The D. capillaris blooms and sets seeds and there are many, many seedlings of this species, and some of Dionaea. Incidentally, I keep both facilities on a constant 18-hour photoperiod. If anyone is interested in the mechanics of the terrarium, I will be glad to provide them (in the past I have had considerable trouble keeping terraria going over long periods). Brookside Gardens is located in the Wheaton Regional Park at 15000 Glenallan Ave., Wheaton, Maryland. Wheaton is about 5 miles northwest of the district line, within the Washington D. C. metropolitan area, for any CPN readers interested in seeing the display or gardens."

KATSU KONDO sent the following: "Mr. Tetsuwo Yamamoto has been working on grafting Nepenthes. But so far, he has had no success. After grafting, in high moisture condition, callus formed. After a while, the graft dropped off, and the plant did not grow any more. Thus, there was a question: was the callus formation a result of attempted grafting? It seemed that the callus might form in high moisture after simple wounding. He has also been working on meristem cultures with Sarracenia. The main purpose of his investigation is how to reproduce many individuals vegetatively as soon as possible."

Katsu will soon have a new generalized article, "Carnivorous Plants", written in English, with two page illustrations (19 photographs included), coming out in the Lasca Leaves which is the publication of the California Arboretum Foundation, Inc. for the Department of Arboreta and Botanic Gardens of Los Angeles County. If you are interested in this reprint, write to Katsuhiko Kondo, Department of Botany, The University of North Carolina, Chapel Hill, N. C. 27514.

Katsu has some comments on Australian Nepenthes: "According to a review of Rica Erickson's book "Plants of Prey" (CPN Vol. 1, No. 1, p. 15), "A possibly controversial section of the book "lumps" the previously accepted eight species of Australian Nepenthes into one, and reasons for so doing are offered." This species reduction for Australian Nepenthes is not Rica Erickson's original. She simply cited Danser's paper (see page 61 in her book, and Bull. Jardin Bot. Buit. IX: 249-438. 1928). According to his observation, Australia has only one species, Nepenthes mirabilis with several growth forms. Nepenthes mirabilis is a trouble maker in the genus: since it has the widest distribution among all the species in Nepenthes and has wider range of growth forms and variations in morphological characters, twenty synonyms are recorded under N. mirabilis (Danser, 1928; Kondo, 1969). Most all herbarium sheets of Australian Nepenthes determined by Danser have been kept in the State Herbarium of Queensland, Brisbane, Australia. During my visit to the Herbarium, in 1966, courtesy of Dr. S. L. Everist, Director of the Herbarium, I studied those herbarium sheets. Indeed, some sheets showed morphological differences in their pitchers, but not in other vegetative characters. Danser died when he was still young and active but he did a lot of work in taxonomy on southeastern Asian flora. His research publications are excellent, and are still very useful, and his systematic treatments remain intact."

Finally, KATSU has come across some interesting postage stamps. "Have you collected the postage stamps showing pictures of carnivorous plants? We can now buy four kinds of stamps of carnivorous plants: 1) Aldrovanda vesiculosa, publ. Rumania; 2) Sarracenia purpurea, publ. Saint Pierre et Miquelon; 3) Sarracenia purpurea, publ. Canada; 4) Heliamphora nutans, publ. Guyana. Don't we need our own carnivorous plant stamps (for example, Dionaea muscipula)?"

RAY NASH of Blackwood, South Australia sends his appreciation for a "most enjoyable magazine." He goes on to say that like so many other people interested in carnivorous plants in Australia, he is a bit of an orchid crank which keeps him busy. But somehow he found time to include a few bits of information for CPN members which goes as follows:

"As Sphagnum moss does not survive the hot dry summers here in South Australia, I am trying to germinate Sarracenia and Darlingtonia seed on clean sand from very old wind dunes. So far there is some success. Usually, I have no trouble germinating these plant seeds but lose them when they get to the four to six-leaf stage. I have found that they do better if placed in an open but moderately shaded place.

"I have a hybrid Sarracenia that has now flowered for me during the past two years. When I first had this plant, it was used to being kept on the edge of a lawn where it was at times watered by the sprinkler. As the mains water here (the Metropolitan Adelaide Supply) is very hard and often loaded with chlorine to kill the bacteria, I thought it would be best to place this plant in a pond of rain water. A pond was constructed so that it had a maximum depth of two and one-half inches. While waiting for the concrete to cure and for any excess lime to be washed out, I still kept the Sarracenia by the lawn, but in the meantime it had been divided up and repotted. When I did put the pots into the new pond, one was left at the lawn site. After a week or so, those plants in the pond had trapped so many flies that their pitchers were full, so I decided to shift the last pot into the pond. The plants grow fairly well in the pond but not as vigorously as at the lawnside site. After reading Mr. Katsu Kondo's and your remarks in the October issue of CPN on salt and these plants, I decided to try one pot back at the lawnside site. The results have been remarkable. This shift was made on the first of January, those plants in the rain water pond are only just starting to put out their second group of leaves which are few and do not exceed one inch in height. The plant at the lawnside has numerous leaves growing strongly and as high or higher than three inches. So much for our hard water which has a bad reputation. The pitchers of the lawnside plant often fill with water as the lawn is being watered. This seems to be all absorbed by the plant within one hour.

"Here in Australia there is to be found on many Drosera species a group of bugs called Crytopeltis. These creatures either feed on the juices of the plants or their victims. They move freely about the stems and leaves, often over the sticky glands. Sometimes one will fall victim. So far there are two named species, C. russellii confined to Western Australia and C. droserae which seems to be Australia wide.

In the eastern states, this last species is often found upon Drosera peltata and D. auriculata. I have also seen it on D. binata on Mt. Lofly (Mt. Lofly is the highest point of the Mt. Lofly Ranges, the hills behind Adelaide, and is approx. 2,200 feet high). These creatures are very shy and will move to the opposite side of the stem or leaf from the observer or just drop off. The adults will often take wing. So to observe these insects one must examine the plants with care. South of Sydney, N.S.W., I have seen a much larger type of Crytopeltis bug on D. binata, a possible new species. These creatures are not shy and are easily handled. I believe that a Dr. China may have named these bugs and also showed a lot of interest in them."

SPECIAL NOTICES

You have noted that the backs of the cover and page 2 of the last issue of CPN (Vol II, No. 1) are blank. However, all of the copy is present, as indicated by the page numbers, unless individual errors of collation have occurred. This was an error of compilation on the part of the printer and not an error of deletion.

Important notice concerning the announcement offering to purchase Japanese carnivorous plant books (CPN Vol. I, No. 4, p. 63): Due to the problems of the dollar vs. the yen, you should add 15% to the basic book cost. If you sent in your order early in the most recent dollar crisis, Joe would appreciate the additional 15% since the cost increase was immediate.

Many subscribers asked us how to obtain the Australian book by Rica Erickson titled "Plants of Prey". This book may be purchased for $4.50 plus postage from Lamb Paterson Pty. Ltd., 19 Main Street, Osborne Park, Western Australia. Rich Sivertsen said that it cost him $9.30 sent airmail which also included the taxes. If you wish to have it sent by surface mail, it probably would cost about $5.50 total, U. S. currency. Very recently, the question of availability (out of print) has been rumored and we would like to confirm this.

Raul Hernandez would like to invite all those who grow carnivorous plants to enter the San Francisco Flower Show which will take place in August. The Bromeliad Society now has a separate classification for carnivorous plants and anyone can enter their plants in the competition. You don't have to be a member to exhibit your plants in the Hall of Flowers. We know that many expressed their intention of entering their favorite plants in pot, or terrarium so we encourage all those interested members in the Bay Area to start their plants for this event.

Here is an especially important notice. BOB ZIEMER has agreed to start and handle a seed and plant exchange for us. He has access to a computer which will be used for search and storage of information when a request or offer of material to exchange comes in. This promises to be one of the most modern and efficient seed and plant exchanges in the world! Here is his prospectus--

I would like to develop some information on the interests and successes of CPN members growing carnivorous plants. There are several reasons for wanting this information. It would help us develop and operate a seed and plant exchange by identifying potential sources of supply. It would give the editors insight into areas of interest for future articles in CPN and make CPN more responsive to the needs of its members. It would facilitate communication between members having similar interests. Once the data is assimilated we could supply a species cross-reference index to members on request, or, if the demand is sufficient, publish the list in a future issue of CPN. Thus, we would like each reader to send me the following information:

1) Name and address
2) Species of CP now being grown successfully
3) Plants you have in sufficient numbers to trade
4) Seeds available to trade or date seed might be available
5) Plants you would like to receive
6) Seed you would like to receive
7) Species you would like more information on (what kind of information?)

Several CPN members have expressed a desire that a seed and plant exchange be started. I am willing to receive, store, and send seed upon request. The seed exchange would work as follows:

<u>For members wishing to supply seed</u> - Send seed to me as it becomes available or send me a note indicating the approximate date seed will be available and send the seed later. Upon arrival, the seed will be dated and stored under refrigerated conditions.

<u>For members wishing to receive seed</u> - Upon receipt of a request, I will send a small packet of seed, if available, or a note stating the date seed might become available. If no supply of seed is on hand, an appeal for seed to supply the exchange will be placed in the next issue of CPN. All requests for seed or information will have to be accompanied by a self-addressed stamped envelope. Requests from foreign correspondents must contain sufficient money (not stamps) for return postage.

Since the exchange has no source of funds to operate, small voluntary cash donations would be accepted for mailing and packing materials. To keep the burden of correspondence to a minimum, replies and thank you notes should not be expected. Periodically acknowledgements of members contributing seed will be published in CPN.

The plant exchange will be handled somewhat differently since I do not have the time or facilities to grow and maintain a wide variety of plants. From the information requested concerning plant availability (item 3), a species index will be prepared and upon request the names of CPN members willing to provide the desired plant species will be sent. A supplier can have his name immediately removed from or added to the list at any time by dropping me a note.

Send the information and seed to start the exchange to:

Bob Ziemer
840 Fickle Hill Road
Arcata, California 95521

SHORT NOTES

The "Memory" of the Venus' Flytrap

by Stephen E. Williams

It is a common observation that at room temperature a Venus' flytrap (Dionaea) leaf will normally not respond if its trigger hair is touched only once but that it will snap shut if a second stimulus is delivered either to the same hair or to any other hair of the trap. It is often stated that the trap "remembers" the first stimulus.

Sir John Scott Burdon-Sanderson first described this phenomenon in 1876 and it has been described by many other workers since then. Unfortunately, despite their extent and elegance, Burdon-Sanderson's experiments are given only superficial treatment in Lloyd's extensive monograph on carnivorous plants so his work has not received the attention that it deserves. It is by far the most accurate description of the movements of Dionaea ever published.

While it is true that the leaf will snap shut after a second touch if the second touch is delivered within about 20 or 40 seconds of the first, stimulation at greater intervals reveals a more complex story. The movement in response to the second touch is not a complete closure and the trap will also respond to a third touch. At a sufficiently long interval the trap will respond to each of a series of touches after the first in a pattern which is best illustrated with Burdon-Sanderson's own data.

Figures 1 and 2 illustrate apparatus similar to that which Burdon-Sanderson used in this experiment. A stylus is attached to a device which fits between the trap lobes so that it swings upward as the trap closes and makes a mark on a smoked drum as the drum rotates. This results in the tracing of the position of the trap lobes on the drum as a function of the time and produces a graph such as that in Figure 3 where time is on the horizontal axis and trap movement on the vertical axis. In the particular graph illustrated the stimuli were delivered at 1 minute intervals. It can be clearly seen that the trigger hair had to be touched six times to close this trap, that there was no response to the first touch (1), that the trap responds to each successive touch,* that the response to each successive touch was greater than to the one preceeding it, and that the movements in response to each touch sum up to close the trap. Animal tissues often produce similar responses to a series of evenly spaced stimuli and physiologists have used the word facilitation to describe processes by which response to a stimulus is increased by a previous stimulus. The "memory" of the Venus' flytrap can more accurately be called facilitation.

If stimulation at one minute intervals reveals this complex pattern, what happens at even larger intervals? Burdon-Sanderson published other data showing that touches spaced at 2 minute intervals did not cause the trap he was observing to move until the trigger hair had been touched 10 times and that it did not fully close until the hair was touched 27 times. In 1916 William H. Brown did experiments similar to those of Burdon-Sanderson. He extended the observations to very long intervals and made a graph of the average number of touches needed to close a trap at each interval. The graph is shown in Figure 4. It gives the results of a series of experiments

* Burdon-Sanderson observed that the movement occurs one second after the action potential sweeps over the trap and about two seconds after the hair is touched. Others have confirmed the first of these observations. For more information on the Dionaea action potential see the excellent papers by Sibaoka, 1966, Symposium for Quantitative Biology 20, 49 and Benolken and Jacobson, 1970, J. Gen. Physiol. 56, 64.

Fig.1.

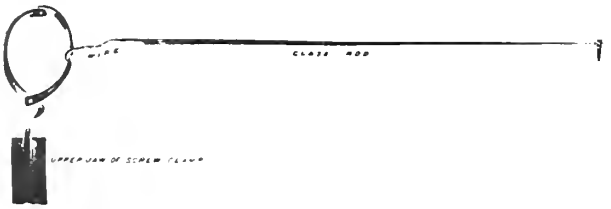

Fig.2.

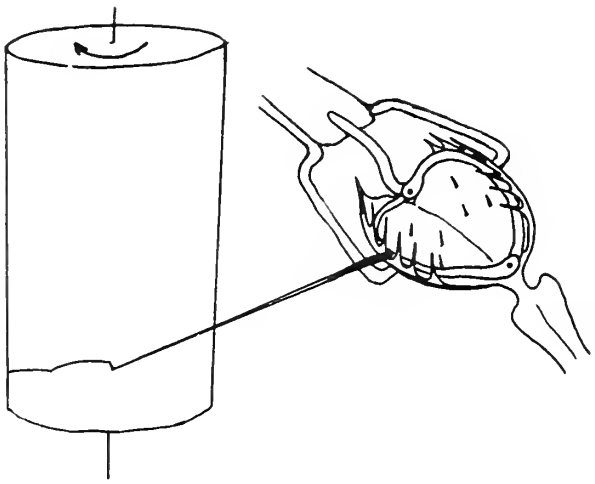

Fig.3.

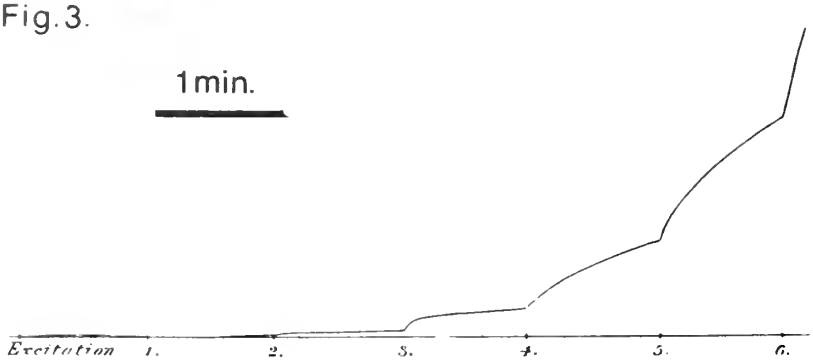

Fig. 1.* Hinged device which fits inside the two trap lobes of a Dionaea leaf.

Fig. 2. The hinged device (Fig. 1) in operation. The trap base is placed on a glass rod which is attached to the screw clamp that supports the stationary jaw of the hinged device. The smoked drum rotates at a constant rate and is marked, as it turns, by the stylus attached to the hinged device.

Fig. 3.* A graph traced by the stylus on the surface of a smoked drum such as that in Fig. 2. The trigger hair was pushed with a camel's hair brush at each of the numbered marks along the baseline. Note that the response occurs just after the stimulus and that the response to every stimulus is much greater than the response to the stimulus before it.

* Negative photographs of original drawings in Burdon-Sanderson and Page, Proc. Roy. Soc. 25, 411 (1876).

Fig.4.

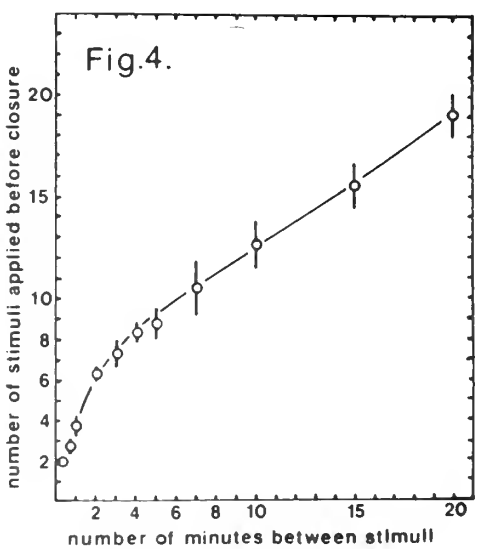

Fig. 4. The average number of times the trigger hair must be touched to close a trap plotted against the length of time between touches applied to the hair. The more frequently the trigger hair is touched the fewer the number of touches required to close it. The bars represent one standard deviation. Plotted from data in Brown, Amer. J. Bot. 3, 68 (1916).

similar to that in Figure 3. The number of stimuli required to close the trap is plotted against the interval between stimuli. The data from Figure 3 could be plotted on the graph at (1, 6). They are somewhat above the average number of stimuli observed by Brown to be sufficient to close the trap at this interval. This is most likely due to the fact that Brown's traps did not have to lift the hinged device and stylus and thus less work was required to move the lobes enough to close them. The data in Figure 4 and Brown's other data indicate that behavior similar to that observed by Burdon-Sanderson at one and two minute intervals can be observed at stimulation intervals of up to 20 minutes.

Of course no insect is going to patiently sit and stimulate a trap at 20 minute intervals for the seven hours it would take to get caught. Only the first two touches are likely to be important in the initial capturing movements in nature, where it may be hypothesized that the lack of response to the first touch benefits the plant by preventing accidental closure by windblown sand, raindrops, etc. As it struggles inside, the insect delivers to the hair many closely spaced stimuli which aid in tightening the trap* but nowhere would one expect to see stimuli applied at intervals similar to those Brown used. What do such experiments demonstrate then? The response to stimuli delivered at long intervals gives us a much more accurate description of the trap movements and allows them to be compared to movements in other plants and animals. The data may help in elucidating the mechanism of trap closure. It should also be of interest to evolutionary botanists since a similar phenomenon exists in Drosera where more than two responses are normally involved in tentacle movement.**

* Burdon-Sanderson proved this by attaching weights to the stylus shown in Figure 1. This forced the lobes open but further stimulation closed them again, lifting the weights in the process.

** The movements of Drosera and their similarity to those of Dionaea are discussed in 1972 in my papers with Barbard Pickard, (Planta 103, 193).

SOME FIELD OBSERVATIONS OF DARLINGTONIA AND PINGUICULA

by Robert R. Ziemer

In mid-February I visited a number of field sites in the Smith River drainage of northwestern California near Gasquet where Darlingtonia (Chrysamphora) californica and Pinguicula vulgaris grow extensively. All of the sites I located were confined to areas underlain by Mesozoic ultrabasic intrusive rocks. I could find no CP sites on the metavolcanic rocks which surround the ultrabasics. Whether parent material is a limiting condition in this region would require a more detailed investigation.

The climate at Gasquet can be classed as Mediterranean--cool, wet winters with warm, dry summers. Rainfall averages 94 inches with less than 5% falling from June through September. Winter temperatures are mild with a mean minimum January temperature of 35° F. and the lowest observed temperature near 20° F. The maximum mean July temperature is about 75° F. with a maximum observed temperature near

103° F. The average length of the 32° F. growing season is 225 days, and of the 28° F. growing season is 300 days. The area accumulates 4,700 heating degree-day units (the accumulation of mean daily temperatures in degree units below 65° F.).

The habitat where these two species were found was rather diverse but a constant water supply with neither drought nor flooding seemed to be present in all cases. Several diverse but typical locations will be described to illustrate the range of habitat.

About a mile north of Gasquet there is a very small flat drainage which flows toward the south with a slope of about 25 percent. Extensive stands of Darlingtonia can be found in the minute creek in an area extending about 1/3 mile in length and 10 to 50 yards in width. Growing amongst the Darlingtonia are scattered Pinguicula. Other dominant interspersed vegetation are sugar pine, cedar, tan-oak, manzanita, azalea, rhododendron, and grasses. The subsoil is reddish and clayey with many rocks and cobbles. The Darlingtonia and Pinguicula roots seem to be confined to a thin surface layer of peaty or marly soil which is quite wet, but without extensive standing water evident. As the site becomes drier, first the Pinguicula disappear and then the Darlingtonia. The Darlingtonia are definitely confined to the moist zone, however. The topographic transition is very gradual, but the hydrologic and vegetative transition is abrupt. The surrounding hillslopes are quite dry at the surface. The surface moisture is supplied by a spring which has been tapped for domestic uses. The aquifer runs over a soil-rock interface about one foot under the surface and emerges in a shallow pit. Darlingtonia first appear where the water reaches the surface and continues downslope until the water enters an obvious topographic channel. The insolation received on this south facing slope is great--being in full sunlight perhaps 80% of the available sunlight hours.

The second site is about one mile further north on a north facing 80% slope which receives less than one hour of direct solar radiation during the winter and perhaps six hours during the summer. Here the Darlingtonia is found in pure stands which are confined to very narrow rivulets that appear dry--even in winter--until one digs a hole through the mat of Darlingtonia roots and dead pitcher leaves and finds free water. The Darlingtonia are confined to a bench about 100 yards wide between the steep fir-covered hillslope and the bare rock cliff of the river. The rivulets could be called a river of pure Darlingtonia, one to three yards wide extending about 500 yards. Nothing successfully competes with the Darlingtonia in these areas--it being a solid mat of plants with an abrupt transition to grass, herbs, and brush at the edges. Where the rivulets reach the edge of the rock cliff only a constant dripping of water is seen and Darlingtonia can be found wherever soil can accumulate among the rocks. Pinguicula can be found only on the rock face in wet, dripping crevices. Many areas where Pinguicula are found receive no direct sunlight during the year. Some are even found growing upside-down on overhanging rocks and must receive very little light. Pinguicula were also found growing in areas with no soil, such as between two tightly pressed cobbles. When the cobbles were removed and separated, no soil could be found. In winter bud, the plants cling so tenaciously

to the rocks that Pinguicula were found growing below the river's winter highwater mark where all other vegetation had been swept away. In summer growth, the leaves seem so delicate and easily damaged that it is difficult to imagine their ability to survive the torrential river flows of winter. Thus, in the first site Pinguicula were found growing among the Darlingtonia, in this site the Darlingtonia were in pure stands and the Pinguicula were confined to the rock face.

In another site Darlingtonia was found growing together with scattered Drosera rotundifolia in a true Sphagnum bog in standing water and very deep mud. (I know this from inadvertently sinking up to my thighs in the goo.) No Pinguicula were found in or near this bog. At this site I found several Darlingtonia growing on a spruce log spanning a portion of the bog. The plants were more scattered than at the previous two sites in that seedlings of spruce and cedar were found growing among the Darlingtonia. The plants could be uprooted with no broken roots simply by pulling on the pitchers, whereas in the previous two sites pulling on the pitchers resulted in broken plants.

A final site on Patrick Creek is interesting for its unique habitat. Behind an abandoned cabin a water diversion had been constructed to carry water from a small creek across a dry southeast facing hillside to some ponds. The hillside had a coarse gravel to cobble soil and a sparse cover of manzanita, ceanothus, and scattered Douglas-fir. A flourishing stand of 18-inch tall Darlingtonia was growing on the banks of the small water diversion channel which carries a flow of uniform depth all year. Thus, even in this severe site Darlingtonia can become established if provided a constant water supply.

In conclusion, in the Smith River drainage carnivorous plants were only found associated with ultrabasic intrusive rocks. Darlingtonia seemed to be limited to areas having a constant and uniform supply of cold water. They were absent from areas that showed either flooding or drought. Soil texture was variable, ranging from wet muck, through thin organic surface soil with a clayey subsoil, to gravel alluvium, to a diversion channel embankment. Aspect and light intensity ranged from full sunlight on a south exposure to a very shaded north exposure having only an hour or so of direct summer sunlight.

Pinguicula showed its best development in the fissures on steep north facing rocky bluffs having constantly dripping water. Here they could be found in pure dense stands wherever water was available and the roots could penetrate the rock. Only occasionally was Pinguicula found growing on the open ground with Darlingtonia as in the first site. Thus, in this region the habitat requirements of Pinguicula seemed to be more exacting than that of Darlingtonia.

RECENT LITERATURE

BioScience Vol. 23 (2), 1973, February issue has a beautiful cover color photograph of Nepenthes macfarlanei Hemsl., and its explanation on page 3.

Fromm-Trinta, E.: Lentibulariaceae do Estado da Guanabara, Brasil. Botanica 42: 1-34 1973 (WRITTEN IN PORTUGESE)
This paper is intended as a complete taxonomic study of the eight species of Utricularia now recognized in the State of Guanabara, Brazil: U. subulata L., U. longifolia Gardn., U. erectiflora St.-Hil. & Girard, U. tricolor St.-Hill., U. geminiloba Benj., U. nephrophylla Benj., U. foliosa L., and U. gibba L. subsp. gibba P. Taylor. As the characters which individualize U. dusenii Sylven var. corcovadensis Merl proved to be inconsistent, it is proposed to call this variety a synonym of U. nephrophylla Benj.

Kasahara, Kazuhiro: Distribution of carnivorous plants. A relationship between the palaeoequatorial relation to the recent distributional area and polyploidy. The Nature and Plants. Vol. 6 (10) pp. 13-18 1972 (IN JAPANESE)
This is a generalized review discussion on distribution of carnivorous plants using a relationship between the Maekawa's hypothesis of phytogeography considering the palaeoequator and polyploidy studied in carnivorous plants. The author tried to find their relationship, but could not. So far as a relationship of cytological data studied and distribution of carnivorous plants is concerned, this is a nice review.

Kashara, Kazuhiro: Traps of carnivorous plants (Photo illustrated). The Nature and Plants Vol. 6 (10) pp. 1-3 1973
A brief popular article illustrated with fifteen photographs.

Kondo, K.: A paper chromatographic comparison of Utricularia cornuta and U. juncea. Phyton 30 (1/2): 43-45, XI-1972
Although many of the constituent spots on the chromatograph are common to both species, certain spots are found in only one or the other. These observations lend support to the previously tendered conclusion that the two species are closely related but still separate species.

Kondo, K.: Chromosome numbers of some angiosperms in the United States. II. Phyton 30 (1/2): 47-51, XI-1972
Some numbers for Utricularias appear for the first time: U. biflora n=14, U. fibrosa 2n=28, U. gibba ssp. gibba n=14, and U. radiata n=14.

Kondo, K.: The chromosome numbers of Striga asiatica and Triphyophyllum peltatum. Phyton 31: 1-2 1973
In this paper, the chromosome number of Triphyophyllum peltatum, 2n=24, was reported for the first time. This species is placed in the Dioncophyllaceae which is anatomically

closely related to the Nepenthaceae and the Droseraceae. The chromosomes of the species were so small and were difficult to compare morphologically with those of the Droseraceae or the Nepenthaceae.

Salamun, Peter J.: Insectivorous plants in Cedarburg Bog. The University of Wisconsin-Milwaukee, Field Stations Bulletin. Vol. 3 (1): 1-5 1970
This is a brief popular article on carnivorous plants in Cedarburg Bog, Wisconsin. The author noted Sarracenia purpurea, Drosera rotundifolia, D. linearis, D. intermedia, Utricularia vulgaris, and U. geminiscapa, as the species in Cedarburg Bog.

Thanikaimoni, G. and Vasanthy, G.: Sarraceniaceae: Palynology and systematics. Pollen et Spores Vol.XIV (2) pp. 143-155 1972
Pollen grains are 3-6 colporate in Heliamphora, 4-6 colporate in Darlingtonia and 6-9 colporate in Sarracenia. There is no correlation between the number of chromosomes and the number of pollen-apertures. Based on their morphological correspondances the intergeneric relationship is brought out. From the palynological point of view, the order Sarraceniales should contain only Sarraceniaceae and it should be placed near Ranunculaceae and Papaveraceae.

Vani-Hardev: Systematic embryology of Roridula gorgonias Planch. Beitr. Biol. Pflanzen 48 pp. 339-351 1972
Roridula was first placed in Ochnaceae, later in Droseraceae and more recently in Bybridaceae. A few taxonomists include it in a family of its own, the Roridulaceae. On the basis of morphological, anatomical, physiological, chemical and embryological data, it is concluded that Roridula rightly deserves the rank of a family Roridulaceae. And its inclusion either in the Ochnaceae, or Droseraceae or Byblidaceae is not appropriate.

Whitehead, B.: Fairy fans. Aust. Plants. 6: 344-347. September, 1972
This is a brief discussion of the NSW Australian species of Utricularia with two fine pictures, a key, descriptions of species and their habitats, and cultural notes.

CARNIVOROUS PLANT NEWSLETTER

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CO-EDITORS: D.E.SCHNELL, RT. 4, BOX 275B, STATESVILLE, NC 28677, USA
J.A.MAZRIMAS, 329 HELEN WAY, LIVERMORE, CALIF 94550, USA

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David Kutt

DR. EDGAR T. WHERRY

TO WHOM THIS ISSUE IS DEDICATED IN DEEP APPRECIATION FOR HIS WORK IN CARNIVOROUS PLANT BOTANY.

NEW SUBSCRIBERS

JAMES A. PAYER (2801 Jackson St., Apt. 12 , San Francisco, Ca. 94115).
JACQUES HALDI (38 Ch de Saule, Bernex (Geneve) 1233, Switzerland).
TOM HOLCOMB (2855 Outlook Drive, Reno, Nevada 89502).
MRS. JAY DE BRUYN (P.O. Box 525, Empangeni, Zululand, South Africa).
RICHARD TUTTLE (2020 Anderson Court, Ann Arbor, Michigan 48104) is a graduate botany student at the University of Michigan. He is interested in setting up insectivorous plants in bog terrariums and determining the effects of growth hormones on them.
NEW ADDRESS: DAVID SCHROEDER, 1841 Monroe, Dearborn, Michigan 48124.
R. M. SPANSWICK (Sec. Gen., Dev., & Physiol., Plant Science Bld., Cornell University, Ithaca, New York 14850).
MRS. JACKIE GOMBERG (9972 Aster Circle, Fountain Valley, Ca. 92708).
J. A. CHAMPNEYS (A6, Kenny Court, Downing College, Cambridge Cb2 1DQ, England) is about to graduate from Cambridge and will then begin work with carnivorous plants, including a possible trip to North Carolina.
JIMMY PAYNE (1255 Oakcrest Circle, Beaumont, Texas 77706).
ALBERT R. MANN LIBRARY, Ithaca, New York 14850.
W. J. FORREST (19 Fairview Place, Te Puke, New Zealand). "I'm a high school teacher by profession. I live in a small town (pop. 3500) on the coast of the Bay of Plenty in the North Island. I might have some problems growing carnivorous plants as we have about 2350 hours sunshine, humidity 70-75%, average rainfall 1750 mm. There is some snow and only a few light frosts a year. The ultra-violet light is very strong, probably as strong as anywhere in the world, and this causes problems with plants to say nothing of materials. Carnivorous plants are only one of my hobbies since I have a large collection of cacti and succulents and trying to build up a large range of bulbs."
JOHN BOURGEOIS (2444 Cranmore Road, Victoria, B.C., Canada) is a second year botany student at the university in Victoria and is presently growing Dionaea at home.
TREVOR A. KUCHEL (Box 110, P.O., Murray Bridge, South Australia, Australia 5253).
ANTHONY REA (296 Precita Avenue, San Francisco, California 94110).
JOSEPH P. ISLEY (1117 Aycock Avenue, Burlington, N. C. 27215).
STANWYN G. SHETLER (Botany Dept., Smithsonian Institution, Washington, D.C. 20560) wrote a very nice Smithsonian pamphlet on carnivorous plants, available from the Institution. (No. 447, with excellent photos. Apparently no charge.)
NEW ADDRESS: RUSSELL L. KOLOGISKI, Botany Dept., N. C. State University, Raleigh, N. C. 27607. Rusty is busy this summer surveying natural areas of North Carolina that seem worthy of inclusion in some sort of system of protection.
RANDY TROUP (141 17th Street NE, Atlanta, Georgia 30309) has studied Sarracenia oreophila intensively and has accumulated quite a bit of new information about the species. As he gathers his material together and does further studies, he will be doing some papers in due course.

NEWS AND VIEWS

RICHARD SIVERTSEN has a couple of items in a recent letter he wrote. He mentions the Japanese technique of propagating Nepenthes cuttings by wrapping the cut end in Sphagnum and then placing this in a pot of pumice stones. They place cuttings in a glass of water for temporary "preservation." Richard also feels that the "outlaw" Utricularias that crop up from time to time in various CP pots (particularly the ubiquitous and almost weedy U. subulata) serve useful purpose by oxygenating the soil and possibly capturing small root damaging subsoil pests. He also expressed dismay with the apparent spread of a damp-off fungus from accidentally introduced Drosophyllum seeds throughout a culture of Pinguiculas. Finally, one of his Australian tuberous species, Drosera peltata, is actually producing droppers in culture. This has been reported as one of the big obstacles to propagation of these species, as Joe Mazrimas mentioned a few issues ago.

DON SCHNELL reports that the pollinated flowers of Heliamphora heterodoxa he described last time are producing seed capsules. You will recall that pollen production has been a major problem with Heliamphoras in most collections, and that he had at last harvested some which he promptly used to pollinate fresher flowers. The pollen fertility test (by the arbitrary lactophenol blue method) was only 10% positive, so numbers may have made up the difference.

J. BOGNER has raised the question of inconsistency in use of the generic designation for the California pitcher plant. We have tended to use Darlingtonia and Chrysamphora interchangeably, whereas the former is formally correct. When it was discovered that Darlingtonia Torrey was apparently incorrect since the designation had already been used (and then abandoned!) for members of the Leguminosae, Chrysamphora Greene was proposed in 1891. But Darlingtonia remained in popular usage and Mr. Bogner informs us and WARREN STOUTAMIRE confirms that Darlingtonia is conserved. RITCHIE BELL says he likes the name better anyway, and that--of course--we are obliged to use Darlingtonia under the rules of conservation. So, Darlingtonia reigns--until something else happens. There is a brief summary of the history of this confusion in the Short Notes section of this issue. We welcome comments from the readers regarding the whole business of conserved names, as well as eponymically derived designations. It does good to shake the dust from time-honored pillars occasionally.

UPDATE ON THE PLANT AND SEED EXCHANGE--BOB ZIEMER, our volunteer curator of the exchange, reports that about a dozen people have replied as of press time. We have seen initial computer printouts of the first eight or so and are impressed. One list consists of the name and address of the individual, what plants he is growing, and what he wishes and has to trade. Another list is by species of plants, each species name followed by a numerical code of growers, the number referring to a master list also supplied. Since delivery of CPN is delayed overseas, we expect that the response rate will rise sharply. Incidentally, even those who do not wish to trade are

encouraged to send in a list of plants being grown. The computer indicates whether you are desirous of trading or not, and your name on the species list may be of help to someone who wishes to correspond with another grower of the same species for various reasons.

STEVE ROSE writes in to tell us that many of the pygmy sundews as Drosera nitidula, scorpoides and leucoblasta can be propagated from leaf cuttings on peat moss. In fact, very vigorous plants are formed at the base of the leaf cutting. The leaves are pulled gently away from the bottom of the plant only. Then remove the scape and lay on peat moss. Keep damp and ventilate daily if in a closed container. They are very hardy and should form plants within 21 days (maybe longer in cool weather). They should also receive a little sun during this time. Be careful on removing little plants from the moss in transplanting because their roots are damaged very easily. Transplant with the parent leaf. Grow in a less humid but not dry place until they strengthen and grow. Use peat moss with some finely sieved leaf-mould (not necessarily rotten) from an evergreen swamp tree for some food. There does not seem to be enough available food in Sphagnum peat moss to allow good growth of these plants.

Cephalotus follicularis can be grown from rootstocks. Steve would not classify this species as being rhizomataceous but possessing a rootstock that increases in all dimensions with age and forms shoots that turn to rootstock every season. He found that rootstocks 1/2 - 3/4 inches below the surface of the peat moss, and not in water, formed shoots weeks earlier than rootstocks in peat moss in water. So it may be advisable not to grow Cephalotus in water until it is established or not at any time. Rootstocks are about 1 1/2 inches long and 3/16 inch in diameter. Lay them horizontally on the surface of Sphagnum or peat and cover lightly to the depth mentioned above. Keep barely damp in bright light until buds show in 3-4 weeks. Plants are not established until several months later. One root may have 1-3 buds. Care must be taken to prevent the cut ends from rotting.

DAVID TAYLOR described his experiences in England with a European Pinguicula. "Pinguicula grandiflora is an attractive plant which is found in parts of western Europe, and is a species that is native to Ireland, in particular the southwest. It is a hardy plant, with ovate to oblong yellow-green leaves which lie in a flattened rosette. Because the plant lies flat, the lower leaves sometimes have the tendency to rot, particularly if they are subject to too much wetness. The overall size of the plant varies from four to six inches, and from May to July it bears single flowers, which are of a deep violet color with a white throat. It is very easily propagated by separating the small plantlets that grow from the sides of the plant. One only has to lift the lower leaves to see these small off-shoots growing around the parent plant."

KATSU KONDO sends a note on conservation: "More Japanese are now interested in problems of conservation of native carnivorous plants in Japan. Drosera indica, D. anglica, Aldrovanda vesiculosa, and

Pinguicula ramosa are protected by law as natural monuments in certain areas in Japan. Also, some carnivorous plant bogs have been entirely protected in the same manner. Recently, five people including Mr. Shosaburo Mori and Mr. Isamu Misoni formed a committee for local carnivorous plant protection located in the Chosei Village Office of Chiba Prefecture. They have set up a carnivorous plant nursery and have transplanted local carnivorous plants there. Since carnivorous plant bogs on the Pacific coast of Japan are now getting polluted and destroyed by industrial factories, special protection is necessary."

KATSU also found an interesting flytrap. A double flowered Dionaea muscipula (many petals and no stamens or gynaeceum) was collected in North Carolina: ca. five miles northwest of Supply City on N.C. Highway 211, Brunswick Co., on June 25, 1972. The specimen has been kept in the Kondo Collection, Chapel Hill, as a document (Kondo 1102). We do not know whether or not it was caused by genetic factors.

taxonomically the most distinguishing bladder of Utricularia tricolor

KATSU KONDO reports that there is a terrestrial Utricularia being grown by various private growers and botanical gardens which has two forms: a large leaf one called U. peltata and a small leaf one called U. tricolor by the growers. Both plants are otherwise morphologically the same and have the same chromosome data:

((K(2n=28) = 2L + 4M + 22S)) and the same chromosome number (2n=28). Peter Taylor and Katsu feel quite certain that the plant is one species, Utricularia tricolor (syn. U. globulariifolia). Peter Taylor says that he is pretty sure that it was originally imported by Dr. Von E. M. Merl (a Utricularia man) from the vicinity of Rio de Janeiro, Brazil to the Munich Botanic Garden (München Botanischer Garten) many years ago. Kew Royal Botanic Gardens has it but it never flowers.

SPECIAL NOTICES

LARRY LOGOGETA writes in to say that anyone who wishes to grow Dionaea and Chrysamphora californica can order these plants from him. He offers two medium size Dionaea bulbs for $1.00 which includes postage. Large and mature Chrysamphora plants are $1.29 each plus postage (about 30¢). Plants and bulbs are sent airmail to anywhere in the United States. Make out check or money order to: Insectivorous Plant Environments, 2700 West Newell Ave., Walnut Creek, California 94529. He will try to send your order within two weeks after receiving it.

Due to the recent devaluation of the dollar, the price of the Japanese CP books have risen. The devaluation delayed shipment of the books from Japan until now so my thanks to everyone who has ordered them for being so patient. All past orders have been sent, and I hope they arrive in good order. Those who still wish to order these books may still do so by looking at the list published in CPN 1 (4), 63, 1972 and noting the price changes given here: Book 1 - $10.00; Book 2 - $1.93; Book 3 - $1.35; Book 4 - $2.30; Book 5 - $1.30; and Book 6 - $8.10. There is a new Japanese CP book with the title The Mystery of Insectivorous Plants by Shimizu, published in 1972 with 54 pages of color photographs. At press time, the price for this book was not known. We will try to find out for the next issue.

Those who wish to grow Drosera filiformis and D. fil. var. tracyi from leaf cuttings can obtain these by sending Joe Mazrimas a self-addressed stamped envelope with a small plastic bag. He recommends an airmail stamp for out-of-state requests.

SHORT NOTES

REMINISCENCES ON CARNIVOROUS PLANTS
by Edgar T. Wherry

In 1913 I was appointed Assistant Curator of Mineralogy in the U. S. National Museum in Washington, D.C. To maintain contact with nature I built a suburban residence and surrounded it with a small wild-flower garden. The significance of acidity in controlling life processes was coming to be recognized, so I decided to study soil acidity in relation to observed peculiarities of distribution of uncommon native plants. To aid in measuring acidity in the field I devised a method using indicator dyes, which soon came into wide practical use.

On collecting trips to southern New Jersey I early became acquainted with Sarracenia purpurea which grows there in humus derived from Sphagnum moss, the acidity of which has a pH number of 4 (in the accepted method of statement, the smaller the number, the higher the acidity). In expanding my field of observation, the same reading was obtained in other areas, and I was ready to class Sarracenia as a typical acid-soil plant. Then, however, I was told

of its growth in an alkaline marl bog at Junius, New York; visiting there, my indicators showed a pH value of 8, which is definite alkalinity, the opposite of acidity.

The explanation proved to concern the nutrient element nitrogen. Most higher plants absorb this through their roots, but since Sarracenia gets it from the insects drowned and digested in the pitcher-liquid, this plant can grow in nitrogen-deficient soils. It commonly grows in acid soils not because of the acidity but owing to the lack of competition there from more ordinary plants.

The same relationship evidently holds for carnivorous plants in general: they occupy habitats so low in available nitrogen that they are not crowded out by competitors requiring relatively large amounts of this element. In a recent number of CPN Drosophyllum was characterized as an acid-soil plant; but some years ago a sample of its native soil was sent to me by a colleague, and it proved to be alkaline, deficient nitrogen being the significant factor.

In the course of my career in Washington I became a part-time horticultural explorer, and in visiting acid-soil areas was early attracted by pitcher plants. Reports on my studies on them were published in 1929, 1933, and 1934. Accordingly, when Mrs. Mary Vaux Walcott proceeded to make color studies of them, she asked me to help her locate the less common species and to contribute to her sumptuous volume, Illustrations of the North American Pitcher Plants, published by the Smithsonian Institution in 1935, technical descriptions and distribution maps.

Unwittingly two invalid species epithets were used--we did not realize that S. alata has priority over S. sledgei, and that S. leucophylla likewise supersedes S. drummondii. In the light of present knowledge the ranges of the species were somewhat too restricted; but one was much too large: that of S. jonesii was mistakenly indicated as extending from the uplands southwestward into the Gulf lowlands. I am now satisfied that the plant so identified there is really an as yet undescribed species.

Invited to teach ecology at the University of Pennsylvania, I moved in 1930 from Washington to Philadelphia. One day I was contacted by a manufacturing chemist who said he was preparing "Sarasin" by steam distillation of Sarracenia flava roots for use by physicians in relieving a painful facial nerve irritation. His suppliers had lost their help through war-time draft, so he asked for aid in locating a source of another species. I directed him to a boggy lake in southern New Jersey, but asked him to leave young plants undisturbed, to which he agreed. Although he obtained enough material to keep his business going, and the sufferings of his doctor-friends' patients relieved, the colony was not permanently damaged and in a few years was as luxuriant as ever.

Things did not always turn out so well. For several years I took my ecology class to a bog near Atsion, New Jersey, where Sarracenia purpurea was abundant, requesting the students not to dig any, which they obeyed. But one spring when we went there, not a pitcher plant was to be seen. Local naturalists stated that a truck with Massachusetts tags had been there, ostensibly gathering

Sphagnum moss, but actually vandalizing the whole Sarracenia patch.

Since I believe in nomenclatorial recognition of taxa which can be readily recognized in the field, and the characters of which exhibit geographic relationships, I get regarded by workers unfamiliar with the plants in the wild as a "splitter." Correspondingly, some of the taxa I have accepted in major categories have gotten reduced in status or even ignored. Typical is the situation with the northern and southern representatives of Sarracenia purpurea. Since they do intergrade there would be no point in following Rafinesque and classing them as distinct species; but as their ranges are distinctive their segregation as subspecies seems reasonable. For what it is worth I may note that they can be told apart in the dark: to the fingertips the pitchers of the northern plant are slippery-smooth, of the southern one rough-hairy.

Indeed, winged taxonomists are dependable here; as pointed out in a recent number of Castanea (see page 51 of this issue of CPN) entomologists recognize distinct species of those remarkable mosquitoes which have developed immunity to the digestive enzymes and so go through their life-cycle in the pitcher liquid. The southern mosquito occupies the Carolinian life-zone, the northern one the transition and boreal life-zones. The state of Delaware lies in the Carolinian zone, but the northern pitcher plant ranges into it; and it turns out that the northern mosquito follows its host plant into the "wrong" life-zone.

In the same article I formally proposed a status change of Sarracenia jonesii for use by workers who question its species distinctness. In the seemingly authoritative Flora Carolina it has been reduced to a mere forma of Sarracenia rubra. But forms are sporadic variants in the midst of normal populations, whereas in this case there is complete geographic segregation, characteristic of the category subspecies.

In an earlier paragraph I indicated the need for further study and naming of the relatives of S. rubra ssp. jonesii in the Gulf lowlands of Alabama and adjoining states. I will close this discussion with pointing out that there is also an unrecognized form of S. purpurea ssp. venosa there: on a visit to Mobile, Ala. in the 1930's I was shown in a garden a strikingly beautiful plant. When the red pigment of ssp. gibbosa is deficient the result is the odd color-form heterophylla, with tissues yellowish throughout. The Mobile variant of ssp. venosa had yellowish herbage, but the flower petals were a lovely bright pink. It deserves rediscovery.

EDGAR T. WHERRY'S SARRACENIA PUBLICATIONS

by J. A. Mazrimas

Edgar Wherry is a prolific writer on various plant species, namely Phlox, orchids, ferns, and rare or endangered species. In addition to these, he published six articles on carnivorous plants between the years 1929 and 1972. Most of his writings were based on several extensive field trips concerned with observing, measuring, and collecting Sarracenia from different localities.

In his first carnivorous plant paper published in 1929, Wherry describes each species of Sarracenia in relation to the acidity of the soil and of the liquor inside the pitcher. As a result of this field study, he discovered a new species that he subsequently named Sarracenia jonesii, a new hybrid, S. minor x S. rubra, and proposed that the variety status of S. purpurea var. heterophylla be called mutation heterophylla. He found that most of the Sarracenia species grew in soil that had an acidity range of pH 4.5 - 4.7. In certain alkaline ponds with deposits of calcium carbonate known as marl, S. purpurea was found to grow here because the soil's nutrient deficiencies allayed competitors. Measurements on the acidity of unopened pitcher liquors showed most of them to be acid with the exception of S. alata and S. leucophylla which were mostly circumneutral.

In the summer of 1932, Wherry took an extensive trip throughout the southeastern range of the U.S. which resulted in a series of publications describing the trip itself, the geographical ranges of the Sarracenia and the naming of a new species. This trip was financed by a Mr. Burk, a noted horticulturist who wished to establish all the Sarracenia species in a wildlife preserve in New Jersey. In order to survive the severe winters in that area, the species had to be gathered from the most northern parts of the geographical ranges. This opportunity allowed Wherry to note various ecological factors in different bogs, to assess the extent of destruction of bogs and meadowland, and to study the degree of intergradation between two species. He published a paper describing colonies of a new species, S. oreophila (mountain loving) which he found growing around the northern Alabama-Georgia state border. Although it is closely related to S. flava, its distinctive flat ensiform phyllodea, flowers with a faint, musty scent and the sparingly pubescent to glabrate umbrella distinguished it from all other species.

In a separate paper, Wherry noted that in examining S. purpurea throughout its extensive range, that there were foliage differences, as noted previously by Rafinesque in 1840, between the average northern and southern plants. Therefore, the southern form, commonly found in the Gulf Coastal Plain up to New Jersey state was designated the subspecies "venosa." A rose-pink flowered form with white sepals was found near Theodore, Alabama and called variety "Louis Burk." The northern subspecies which intergrades with the southern form around New Jersey was termed "gibbosa" and is exceptionally bristly on the outside of its long and narrow pitchers. Although "venosa" is short and broad in outline, with the hollow part averaging less than three times as long as wide, the wings may extend well beyond the lip of the hollow part. On the other hand, the narrow-winged variety ("gibbosa") has a range extending north from Maryland-Delaware to as far west as the eastern slope of the Cascade range. (See CPN 1, 1972.) This variety has a true yellow-flowered mutant now called S. purpurea forma heterophylla.

In Wherry's fifth publication, a real need arose for satisfactorily mapping the distribution of nine species of Sarracenia because of

errors made by previous publications. Each species was plotted on a separate map which had two geologic lines superimposed: a northern latitude line about the 40th parallel representing the limit reached by the last Wisconsin ice sheet, and a southern latitude line which snakes above and below the 35th parallel and denoted the fall line. This latter line indicates the maximum point to which the seas extended during the Cretaceous time about 80 million years ago and inundated much of southeastern North America. Many species of flowering plants grew in alluvial sands and clays on boggy pleneplains above this fall line. Meandering streams and lakes as well as swamps and bogs dotted the land under the warm semi-tropical sun. During the Terciary uplift of the land, mountains began rising, some plants adapted to the cooler climate of elevated areas while other plant species gradually occupied the land left by the retreating sea. Usually, plants and their seeds found their way down various river valleys and finally developed colonies on the newly formed Coastal Plain.

It is believed that the Sarracenias migrated in this manner.

Darlingtonia developed colonies far on the Western Plains so that when the Rocky Mountains and later the Sierras began their uplifts during and after the Terciary Period, the seeds failed to reach drainage basins of the eastern rivers. Each of the species seemed to remain either in mountain growing areas or seeds that were dispersed followed certain defined river systems and thus remained there since the close of the Terciary Period. Peninsular Florida emerged late from the seas, too late for most species to form colonies there.

The final paper concerns certain aspects of taxonomy. He feels that C.R. Bell was incorrect in assigning S. jonesii to status of a form of S. rubra but insisted its distinctiveness is such that its rank should be raised to that of subspecies. The two purple pitcher plants, S. purpurea ssp. purpurea (northern range renamed from ssp. gibbosa) and S. purpurea ssp. venosa (southern range) are distinguishable on both morphological grounds discussed above and the fact that the plants are hosts to different Wyeomyia mosquitoes: in the north W. smithii, and in the south W. haynei.

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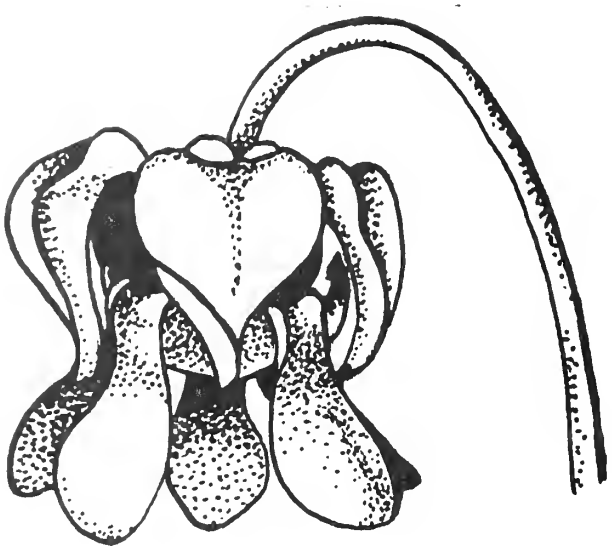
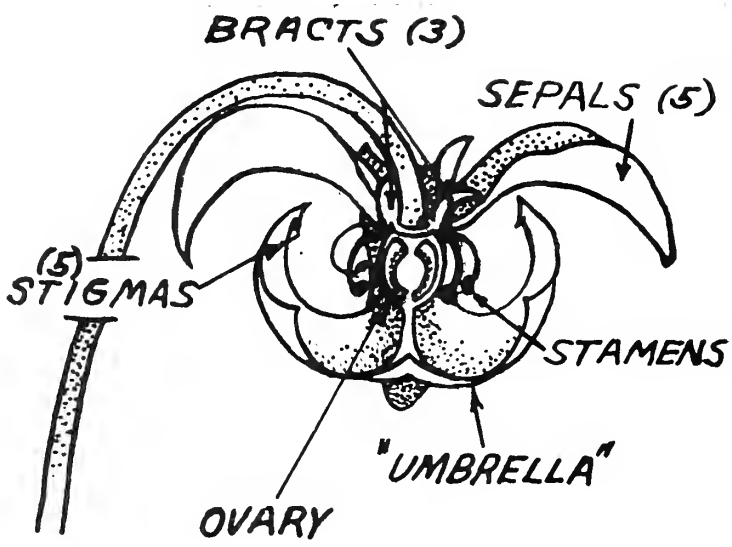
POLLINATION OF SARRACENIAS BY HAND

D. E. SCHNELL and DAVID KUTT





Several people have written and asked about pollinating Sarracenias, so here goes. First of all, review the general plan of dicot flower anatomy if you are not familiar with it. The flowers of this genus are so constructed that natural cross-pollination is almost assured. Note that the five pendulous petals of an essentially upside down flower hang over the deep arcs of an inverted umbrella-like structure. The "umbrella" is really an expanded portion of the style connecting the stigma lobes with the ovary. Careful inspection of the five upward pointing tips of the inverted "umbrella" discloses a small, narrow cleft, and at the bottom of this cleft on the inside surface of each umbrella tip is a tiny projection that is a stigma lobe, the portion that receives pollen. After the flower has been out for three to five days, usually when petal color is at maximum. lift or remove a petal and note that the yellow, powdery pollen has "puddled" into the inverted dome of the umbrella, having fallen from the ripened stamen anthers hanging above. The pollen can easily be removed with the flat end of a toothpick and then applied to stigma lobes of the same or another flower of the same or other Sarracenia species. Sarracenias are notorious hybridizers, so change toothpicks (brushes are too hard to clean and too expensive to use once) and thereby avoid pollen "contamination" where not wanted. Oh yes, if your plants are outdoors or otherwise exposed to potential insect pollinators and you wish to keep everything straight, cover each flower with some sort of light bonnet, such as can be made with an unfolded 4x4 first aide gauze pad over the flower and snugged(not strangled) around the flower stalk. Smaller flowers(e.g. S.psittacina) require more dexterity, but then you will appreciate the gymnastics an insect pollinator must go through. Not only is the pollen in an essentially curtained off antrum, the stigma lobes are tucked out of breezes, and pollen will not fall up.

A SALUTE TO SIR JOHN BURDON-SANDERSON AND MR. CHARLES DARWIN ON THE CENTENNIAL OF THE DISCOVERY OF NERVE-LIKE ACTIVITY IN THE VENUS' FLYTRAP

By Stephen E. Williams

In the year 1873 Charles Darwin was deeply involved with the study of carnivorous plants that was to culminate with his publication of his book, Insectivorous Plants, in 1875. He had a number of discussions with his friend and fellow member of the Royal Society, John Burdon-Sanderson about the possibility that excitable cells of plants such as Drosera (Sundew) and Dionaea (Venus' flytrap) might exhibit phenomena similar to those present in excitable animal tissues such as nerve. Burdon-Sanderson's diary was filled with references about his communications with Darwin on the subject during this period.

On September 9, 1873 the two passed the conversational stage when Darwin sent Burdon-Sanderson the following letter:

> "I will send up early tomorrow two plants [of Dionaea] with five goodish leaves, which you will know by their being tied to sticks. Please remember that the slightest touch, even by a hair, of the three filaments on each lobe makes the leaf close and it will not open for twenty-four hours. You had better put 1/4 in. of water into the saucers of the pots. The plants have been kept cool in order to retard them. You had better keep them rather warm (i.e., temperature of warm greenhouse) for a day, and in a good light.
>
> "I am extremely glad you have undertaken this subject. If you get a positive result, I should think you ought to publish it separately, and I could quote it; or I should be most glad to introduce any note by you into my account.
>
> "I have no idea whether it is troublesome to try with the thermo-electric pile any change of temperature when the leaf closes. I could detect none with a common thermometer. But if there is any chance of temperature I should expect it would occur some eight to twelve or twenty-four hours after the leaf has been given a big smashed fly, and when it is copiously secreting its acid digestive fluid.
>
> "I forgot to say that, as far as I can make out, the inferior surface of the leaf is always in a state of tension, and that the contraction is confined to the upper surface; so that when this contraction ceases or suddenly fails (as by immersion in boiling water) the leaf opens again, or more widely than is natural to it.
>
> "Whenever you have quite finished, I will send for the plants in their basket. My son, Frank, is staying at 6, Queen Ann Street, and comes home on Saturday afternoon, but you will not have finished by that time."

Burdon-Sanderson, who was to become a Professor at Oxford Medical School and the leading British physiologist of his day, must have been very excited by his results for when he deemed them satisfactory - on September 12, 1873 - he immediately telegraphed Darwin at his country home* to tell his findings. Unfortunately, the telegram has apparently been lost. However, we can gain some understanding of it by reading Darwin's letter of reply which was sent on September 13, 1873.

> "How very kind it was of you to telegraph to me. I am quite delighted that you have got a decided result. Is it not a very remarkable fact? It seems so to me, in my ignorance. I wish I could remember more distinctly what I formerly read of Du Bois Raymond's [sic.] results. [Du Bois-Reymond discovered that electrical impulses carry messages in nerves.] My poor memory never serves me for more than a vague guide. I really think you ought to try Drosera." **

This was the first detection of nerve-like activity in any plant. Excitable plant cells and excitable animal cells were shown to have similar properties. Burdon-Sanderson went on to do numerous elegant experiments on Dionaea and it is from him we learned most of what we know about the physiology of its rapid movements.

Burdon-Sanderson used the most modern techniques of his time in his studies. His methods were superior to those used as late as 1930 in investigations of Dionaea. With the exception of one minor drawing of a trigger hair,*** which was most likely not done by him, I have never found any of his data to be in error. His work still provides the major body of knowledge about the nerve-like activity and the rapid movements of Dionaea and it should not be ignored by those who wish to study these phenomena.

On the following page is a bibliography of Burdon-Sanderson's papers on Dionaea. It is possible that I have overlooked a few publications and that a thorough search of journals such as Nature would reveal more papers published by him on the subject. However, this bibliography is the most complete list of Burdon-Sanderson's work on Dionaea that I know of and it should be of use to anyone interested in the excitability of the Venus' flytrap.

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* Efforts to locate the telegram at Kew, Down House (Darwin's home), Oxford and Cambridge have all failed. If anyone knows of it or its contents I hope he will publish it in the Newsletter.

** Unfortunately, Burdon-Sanderson did not "try Drosera" but Darwin's suggestion was carried out at Washington University in St. Louis during March 1968 (although we did not know he had suggested it at the time) and nerve-like activity has been discovered in that genus of plants as well (See Williams and Pickard, Planta 103, 193, 1972).

*** In paper number 12.

Burdon-Sanderson on *Dionaea*

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* At the time these articles were written "Biol. Zentralbl." was spelled "Biol. Centralbl."

** A paper delivered before the Royal Society on June 9, 1882 and published posthumously in Burdon-Sanderson's biography.

GROWING SARRACENIAS

by D. E. Schnell

There are about as many guaranteed ways to grow Sarracenias as there are purported cures for warts and hiccups. When such a situation prevails, one is led to one of two conclusions: either none of the methods work, or they all work--at least to some degree. Happily, the latter case most closely approximates the situation with this genus. What follows, is necessarily a highly personalized discussion. I am sure there will be vigorous disagreement with some of the comments and suggestions. All I can say is that they have worked for me over a period of close to fifteen years. Rather than discuss each species individually, I think it would be more coherent to mention general principles and then mention only the inevitable exceptions by name.

DORMANCY. All members of this genus require a dormancy period. To deny this and force growth is to invite rot and disaster. If you are growing your plants outdoors or in a greenhouse, the shortening photoperiod of early fall and hard frosts with falling average daily temperatures will take care of dormancy. Do not forget to lower the greenhouse temperature to 40 or 50° F. at night. If you are growing in terrariums on window sills or under lights, you will have to beware high winter house temperatures in the former instance, and remember to shorten the photoperiod and lower temperatures in the latter.

TEMPERATURES. During the active growing period, Sarracenias are remarkably immune to high temperatures, providing they are not allowed to dry up and that humidity is also commensurately high. This should be no problem except in deserts, high plains or overly dry greenhouses where provisions for extra humidity will have to be made. Most other areas have sufficiently high humidity during summer months. There is one exception: after S. purpurea has reached maximum development in late spring, it requires semi-shading and cool root temperatures during hot summer months. But earlier, full sun is necessary for good flower and pitcher formation. How cold can you let a pitcher plant get? I leave most of my plants outdoors over winter here in central North Carolina where temps frequently drop to near zero F. And of course, S. purpurea naturally and S. flava as an introduction have survived ridiculously low temps in the north country. The secret is a moist growing medium all winter long and not allowing the roots to freeze. If you grow your plants in large tubs, I would suggest burying these in the ground to rim level over winter in the north, or place them in an area of partial protection such as a cold cellar. I have had pitcher plants survive -20°F. for four days running outdoors in little plastic refrigerator-type containers in Ohio, but not very well. Generally, the purely southern species (S. leucophylla, S. minor, S. psittacina, etc.) will withstand cold much less well than S. flava or S. purpurea. The plants may survive, but will be weakened and not at their robust the following summer, and over several seasons, will eventually die off. Protect these species in the north, but not too much!(remember dormancy).

WATER. Water all Sarracenias copiously; keep humidity high. In nature, it is true that S. purpurea and S. psittacina seem to prefer very wet areas while S. minor is found more often in drier areas, and the others in between. But there are complex ecologic and competitive factors at work in the field in these cases. If you balance all the other factors herein outlined, all of the genus can be grown quite wet, and will do better for it. There is much written about chlorinated and hard water vs. nice soft rain water or well water from granite bedrock. I have used mildly chlorinated rather hard city water with no ill effects that I could attribute to the water. I think in the past that there have been too many inductive leaps in reasoning due to not recognizing other variables. If you let city water stand for a few days, that will take care of the chlorine. But water from a water softener or from de-ionizers is certain death--the supposedly noxious calcium is removed, but more detrimental sodium is added. More important than total ions present may very well be what kind of ions are present. But to keep your thinking clear on the matter when you are first starting out and have many variables to content with, use dechlorinated and naturally soft or distilled or rain water, and experiment cautiously with handier tapwater later on.

HUMIDITY. (See Water above also). Remember that relative humidity is just that, relative. It is a percent of saturation of the air with water vapor at a particular temperature. With no addition to air water, falling temps tend to raise relative humidity, while rising temps lower it since warmer air is capable of holding more water vapor. Thus you can easily approach 100% relative humidity at nighttime temps of about 50°F., but in the day when temps may get to 90°F., 60-70% relative humidity is quite adequate and actually there is more total water vapor in the air than at the lower temp. The edges of pitcher plant "lids" will begin to brown first before gross wilting when relative humidity is chronically too low and/or there is too much air movement.

SOIL MEDIUM. Now we come to the crunch. Quite frankly, there is no substitute for growing all Sarracenias in live Sphagnum, the next best thing being dead "long fiber" sphagnum moss of the nursery trade. The Japanese for years have found this medium most satisfactory, and slowly, most of us in the U.S. and elsewhere are converting with very happy results. I grow my plants in plastic tubs or in three foot plastic-form children's wading pools, with no drainage holes. The medium stays very acid, most nearly approaches Sphagnum bogs and wet areas where most species of the genus in their best form are found in nature, and Sphagnum probably provides many benefits to the plants as yet undefined. There are hues and cries for pure sand, perlite and vermiculite combinations, sand mixed with ground peat, etc. But from what I have seen first hand and heard about such setups, the plants are subsisting rather than proliferating. Unless you are doing experiments in nutritional and digestive physiology, non-sphagnum mixtures are not recommended. Many plants are taken to greenhouses where they are to be grown in captivity so that various biosystematic studies can be followed closely and at leisure. But to grow a plant so that it is not likely to reach

its maximum development is to make some very poor comparisons and conclusions. Plants grown in subsistent media or where it is too cold or too dry, are all going to tend more and more toward a retrogressive common denominator in form, a backtracking to least defined and specialized morphology. Sure, you will still be able to tell S. psittacina from S. flava grossly, but many fine points and subtleties of differentiation that can easily be seen in the field will be poorly developed or absent. And these very points may have been of most interest to your observations. In addition, there will certainly be changes in color and chemistry.

FERTILIZERS. Not recommended and not needed when growing in Sphagnum, even without bugs!

SUMMARY. In my experience, anyone can grow Sarracenias if each of the above six factors are always taken into consideration in balance. If one or more is not right, then problems will surely develop.

(JOE MAZRIMAS has some further hints for dry inland areas of the west coast.)

"I would like to add a few words on growing Sarracenia and Darlingtonia in the Pacific states. The summer climate here is relatively hot, windy and dry which makes it unsuitable to grow pitcher plants that are normal in size and shape. This is especially apparent in the formation and growth of new pitchers which are soft and have a tendency to dry out before maturity under the influence of the above mentioned climate conditions. On the other hand, if growing pitchers can be protected either in a greenhouse or a suitable terrarium until the new pitchers have hardened, then the plants can be removed from either structure and allowed to capture insects as in nature.

"I use a plastic shoe box or sweater storage box which you can purchase in large department stores. I fill the bottom with perlite to a depth of 1-2 inches. Next, I add sphagnum moss to the top and plant the rhizomes of various pitcher plants. Then, four bamboo stakes are cut to the same size and each one is inserted into the corner and taped to the box with waterproof tape. Polyethylene sheeting is cut and wrapped around the stakes and taped. The plastic cover which comes with the storage box fits snugly on top supported by the stakes. This way the inside air remains humidified. Water is added to the box until the level reaches the top of the perlite layer.

"Set the box in a partially sunny area so that heat buildup is at a minimum. Usually, most of the new season's pitchers are formed in the spring so that after they have hardened the top of the plastic cover can be removed in order to capture insects."

DARLINGTONIA VS. CHRYSAMPHORA

by J.A. Mazrimas

Several inquiries have reached our office regarding the usage of the genus name Chrysamphora in a previous CPN article and several notes thereafter. The name was proposed by the University of California botanist, Edward Lee Greene (1845-1915) who was a rather outspoken taxonomist of his time and many of his criticisms were published in his own journal called Pittonia. (1) Among the many articles that Green wrote, one was titled "Against the using of revertible generic names" in which he noted the fact that many taxonomic names slip about from genus to genus in a fashion that is most prejudicial to stability. He continues by saying that action should be taken against insecurity of tenure mostly due to the lack of caution on the part of authors in naming genera. The tenure of Darlingtonia for the California pitcher plant was "rendered too precarious. It may fail us any day" upon the discovery of additional characters. So he subsequently proposed in a brief paragraph the genus name Chrysamphora.

How did this mixup occur? The name Darlingtonia originally proposed by De Candolle in 1824 (2) was applied to a legume but the name was abandoned in 1842 by Bentham after he made it a synonym of Desmanthus. In 1851 (3) John Torrey insisted on honoring his good friend Dr. William Darlington, so he dedicated a new collection of plants discovered by Col. Fremont in California as Darlingtonia rediviva. This was published in an overlooked abstract. In 1853, in a different publication, (4) Torrey adopted the name Darlingtonia as a different genus applied to the California pitcher plant. In his article, he explained that the Californian plant to which he had assigned this name from imperfect specimens proved to be only a species of Styrax which he then named S. californicum. Later, L.C. Wheeler transferred the Torrey name D. rediviva to Styrax rediviva.

Since 1891, when the name Chrysamphora was proposed in an attempt at stabilization, (5) it was used by only a few authors, namely Thomas Howell and earlier E.T.Wherry. Meanwhile, usage of the name Darlingtonia seemed to be universal. The monographs on Sarraceniaceae by Macfarlane (1908), Harper (1918), Uphof (1936), Lloyd (1942) used it not to mention the various indices, flora manuals and textbooks.

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Quite reluctantly, somewhat timidly, and with apology, we find it necessary to increase the subscription rates by one dollar per volume. We hoped to avoid this increase and have spent a year or so trying to think of ways out of it, but the increasing size of the issues with greater printing costs and mailing weight, and the certainty that U.S. postage will increase precipitously again the first of the year, compel the increase. Several readers have commented voluntarily that they felt such an increase would be necessary and that they think it is fair. We hope the remainder of the subscribers feel the same. These rate increases will again just about take care of expenses. If any excess funds do accumulate, they will be used for special large issues or more photo plates. We have been pleased with the success and growth and reception of CPN, and rather than produce smaller, less useful issues or cut down on quality of production, we hope to go on serving the communication needs of carnivorous plant botanists.

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RECENT LITERATURE

Brunard, A. and Turlier, M. F.: Monopodial and symposial structures: some controversial examples. Bull. Soc. Bot. Fr 118 (7/8), pp 543-559 1971

The authors used Pinguicula vulgaris for studies into the shoot construction during growth of the plant. They showed that this species had a symposial structure.

Ceska, A. and M.A.M. Bell: Utricularia (Lentibulariaceae) in the Pacific Northwest. Madrono 22: 74-84 1973

A key to five species of Utricularia found in the Pacific Northwest, U. vulgaris, U. intermedia, U. ochroleuca, U. minor, and U. gibba, was made. Also, those five species were described in this review.

Daumann, Erich: On the problem of the "deceitful blossoms." Preslia 43(4) pp 304-317 1971

IN GERMAN

Deceptive flowers are those that deceive potential pollinators as breeding or egg laying areas, as sexual partners or as territorial invaders. Pinguicula flowers are one of the examples given in this category. They are categorized as belonging to relatively young families and are a product of specialization and reduction processes.

Franck, Daniel H.: Comparative morphology of the adult and juvenile leaves of Darlingtonia californica. Amer. Jour. Bot. 60 (4) Supp. 38, 1973

This abstract describes D. Franck's continuing research (see CPN 1, 48, 1972) into plant morphology. Juvenile leaves differ from adult leaves because they lack both a keel and fishtail appendage. In addition, the author also observed differences in divergence angles of the leaves, phyllotactic indices, apical meristem and differentiation.

Komiya, Sadashi: New subdivision of the Lentibulariaceae. Journ. Jap. Bot. 48 pp 147-153 1973

This is a summary of his D.Sc. dissertation (see CPN Vol. 1, p. 30). Komiya's work proposes a new systematic treatment for the Lentibulariaceae: 3 subfamilies, 5 genera, 4 sections of Pinguicula, 8 subgenera and 11 sections of Utricularia, and so on. Generally speaking, at the present time the genus Biovularia and the genus Polypompholyx are considered to be in the genus Utricularia. In the United States, the type genus of Biovularia, B. olivacea (Wright) Kam., is placed in a Utricularia and is called U. olivacea Wright ex Grisebach (all recent new manuals of vascular flora in the U.S.).

Kondo, K.: The chromosome number of Utricularia denticulata Benjamin Annals of the Missouri Botanical Garden 59 pp 474-476 1972

Utricularia denticulata which grows in Mexico was reduced to a synonym of U. livida E. Meyer by Taylor (1964). Utricularia denticulata has the meiotic chromosome number 18 which is the

same as that of U. resupinata. Both Utricularia resupinata and U. denticulata are indigenous to the New World. The basic chromosome number X=9 for Utricularia is still found only in the New World species.

Kondo, K.: The chromosome number of Nepenthes x mixta. Journ. Jap. Bot. 48:6 pp 189-190 1973
Male flower buds were used and n=40, which is at variance with 2n=78 in two other species previously counted by Kondo. The possibility of the existence of sex chromosomes in this genus was mentioned.

Kondo, K.: Carnivorous plants. Lasca Leaves 28 pp 77-84 1973
This is a popular summary article in which the major classes of carnivorous plants are discussed, examples mentioned, and good photos are included--mostly of non-U.S. species. (Katsu has offered to send reprints of the article to anyone requesting it. K. Kondo, Dept. of Botany, University of North Carolina, Chapel Hill, North Carolina 27514.)

Kurata, Shigewo: Biology of Nepenthes. Iden (Genetics) Vol 26 (10) pp 43-51 1972
IN JAPANESE
Nepenthes were reviewed: geographic distribution, habitats, descriptions of 69 species, morphological characters, carnivorous function, and so on. The author went to the Philippines, Borneo, Sumatra, and Malay Pen. for Nepenthes hunting. His field observations on Nepenthes are the most important part of this paper.

Morat, P.: Les Droseracees A Madagascar. Centre O.R.S.T.O.M. De Tananarive pp 1-3 + one page for a key
IN FRENCH
Five species of Drosera in Madagascar are briefly discussed with a key to them: Drosera burkeana, D. madagascariensis, D. natalensis, D. humbertii, and D. indica.

Pickard, B.G.: Action potentials of higher plants. Bot. Rev. 39 pp 172-201 1973
The author briefly reviews her work with Williams (see previous CPN Lit. Reviews) regarding receptor and action potentials of Dionaea and Drosera, and then goes on to discuss action potentials in other species of non-carnivorous plants in many stages of plant growth and activity. This review article is well done.

Shibata, C. and S. Komiya: Changes of nitrogen content in the leaf of Drosera rotundifolia during feeding with protein. Bulletin of Nippon Dental College, General Education Vol. 2 pp 89-100 1973
IN JAPANESE
This is an experimental series supplemental to a previous investigation (Bull. Nippon Dental Coll. Gen Educ. Vol. 1 pp 55-75; CPN 1:32 1972). In summer, Drosera leaves continue digestion and absorption for about sixteen hours after feeding,

but the leaves forming winter buds are only active about six hours, A leaf absorbs 0.05 to 0.1 mg. N of protein/ 24 hours. Disparities among the processes of digestion, absorption and transference are recognized; they are probably caused by the varying amino acid composition of the protein fed to leaves. Nitrogen absorbed into the leaf is transferred quickly to other parts of the plant, or spent on leaf growth. The accumulation of nitrogen in the leaves does not exceed about 10% increase. Furthermore, depending on timing (up to 24 hours), nitrogen decreases to the usual leaf level (i.e., 11.2 mg. N/gr. leaf, dry weight). Transference of the nitrogen absorbed into the leaf is discontinuous, so that there are interval peaks (twice in 24 hours).

Shilov, M.P.: Association of some aquatic plants of the lower Amur with definite depths of water. Byull. Mosk O-va Ispyt. Prir. O'td. Biol. 77(2) pp 96-103 1972
IN RUSSIAN

Among other aquatic species, Utricularia vulgaris was found to grow strictly at a critical depth where frequency of its occurrence was optimum.

Thoen, Daniel and Bracke, Andre: Phytosociological and mycological exploration of the Rixensart heath and land approaching it. Nat. Belg 52(5) pp 225-244 1971
IN FRENCH

This heath in Belgium was re-examined and was shown to be in the midst of considerable evolution. Most of it was due to human pollution and general lack of interest and care. However, colonies of Drosera rotundifolia managed to survive despite the frequent weekend trampling of the area by scouts.

Wherry, Edgar T.: Notes on Sarracenia subspecies. Castanea Vol. 37 pp 146-147 1972

The author proposes that the species he previously designated Sarracenia jonesii be recategorized S. rubra ssp. jonesii. Serious questions have been raised since the original specific designation, but the author feels that geographic and morphologic differences indicate that the plant is more than a form, thus the subspecies designation. He further reviews the nomenclature of the northern and southern taxons of Sarracenia purpurea, suggesting that separate specific designations may be too much, but that subspecific designation is clearly still indicated based on geographic, morphologic and certain striking insect associate differences. The northern plant would then be S. purpurea ssp. purpurea (eliminating the old "gibbosa" designation) and the southern plant S. purpurea ssp. venosa.

Special issue for Nepenthes lovers-- Garden Life Vol. 12(8) 1973

The Garden Life is the best magazine for Japanese horticulturists written in Japanese. Color photos are excellent. Published by Seibundo-Shinko Sha Co., Ltd. Nishiki-cho, Kanda, Chiyoda-ku, Tokyo. 350 (Yen) + postage (U.S. $1.00 = 260 yen).

The articles are the following:

Kondo, M. Interesting Nepenthes. pp 9-11 12 big excellent color photo illustrations.

Kurata, S. Localities of Nepenthes: Borneo and Sumatra. pp 12-13. 15 excellent photo illustrations including N. lowii, N. tentaculata, N. burbidgeae, N. rajah, N. villosa, N. mirabilis, N. calunculata, N. pectinata, N. dubia, N. tobaica, and N. bongso. Explanations on page 27.

Komiya, S. Distribution and morphology of Nepenthes. pp 15-18.

Kurata, S. Visit to Nepenthes natural habitats. pp 20-23.

Kondo, M. Species of Nepenthes cultivated. pp 25-26.

Kondo, M. Nepenthes cultivation. pp 28-30.

MISCELLANY

Rationalization: "If you find any mistakes in this newsletter, they were placed there on purpose. We try to publish something to please everyone and there are a few readers always looking for mistakes."

* * *

"What's this I hear
About the new Carnivora?
Can little plants
Eat bugs and ants
And gnats and flies?
A sort of retrograding;
Surely the fare
Of flowers is air,
Or sunshine sweet:
They shouldn't eat,
Or do aught so degrading."

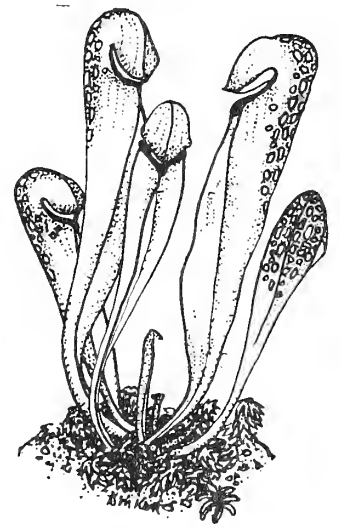
(Dr. Wherry led us to this anonymous poem, appearing in a paper in Vol. 29 of Torreya, No. 4, p 85, R. Darnley Gibbs on The Trap of Utricularia. Perhaps so many--too many in our opinion--of today's scientific papers would be less dry reading if the skilled anecdotal techniques of the older authors were not lost.)

* * *

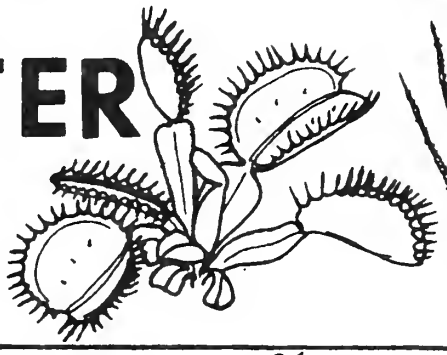
JOE MAZRIMAS did some etymology for us:

WHAT DO THE NAMES MEAN?

Aldrovanda	Named after Ulisse Aldrovandi, 1522-1605, Italian naturalist and author of famous work on natural history.
Byblis	From the Greek, byblis, meaning nymph??
Cephalotus	From the Greek word kephalotos meaning "headed" which refers to the filaments of the stamens.
Drosophyllum	Dew-leaf; in allusion to leaves being beset with stipitate glands, appearing like dew.
Drosera	From the Greek meaning dewy, from the glittering, glutinous droplets secreted by the glandular tip of each tentacle.
Darlingtonia	Named after Dr. William Darlington, 1782-1863, American botanist.
Dionaea	A surname of Venus, goddess of love, and daughter of Jupiter and Dione.
Heliamphora	This generic name is from the Greek meaning marsh-pitcher.
Nepenthes	From the Greek word meaning without care, in allusion to the statement in the Odyssey where Helen drugged the wine-cup with the drug Nepenthe so that its contents freed men from grief and care.
Pinguicula	A diminutive from the Latin word for fat; referring to the greasy texture of the foliage.
Sarracenia	Named in honor of Dr. Michel Sarrazin, 1659-1734, a physician at the Court of Quebec who sent S. purpurea to Tournefort.
Utricularia	From a Latin phrase meaning little bag.



CARNIVOROUS PLANT NEWSLETTER



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CO-EDITORS: D.E. SCHNELL, RT. 4, BOX 275B, STATESVILLE, NC 28677, USA
J.A. MAZRIMAS, 329 HELEN WAY, LIVERMORE, CA 94550, USA

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CEPHALOTUS FOLLICULARIS

The pitcher on the right is hemisected.

NEW SUBSCRIBERS

LESLIE J. MEHRHOFF, JR. (Box U-43, University of Connecticut, Storrs, Conn. 06268) is a graduate student working in biosystematics.
MR. AKIRA NAITOH (Export Group, Fertilizer Dept., Mitsubishi Corp., CPO Box 22, Tokyo, 100-91 Japan).
KIMBERLY EDWARDS (P. O. Box 4115, Arcata, California 95521).
MYRON KIMNACH (1600 Orlando Road, San Marino, California 91108).
SAMUEL POTTER, JR. (1119 N. Sweetzer Avenue, #9, Los Angeles, California 90069).
VINCENT BELLIS (Dept. of Biology, East Carolina University, Greenville, North Carolina 27834).
PAUL BAUER (260 Somerset Road, Akron, Ohio 44313).
RICHARD H. MUNSON (The Holden Arboretum, Sperry Road, Mentor, Ohio 44060) is horticulturist and plant propagator for the arboretum.
C. CRAIG COLEMAN (1101 Walker Drive, Kinston, North Carolina 28501).
BARBARA FORD, DR. RALPH BRAUER (7205 Wrightsville Avenue, Wilmington, N. C. 28401) work in the Institute for Marine Research but are planning some research with Drosera rotundifolia.
BOTANIC GARDEN OF THE CHICAGO HORTICULTURAL SOCIETY (775 Dundee Road, P. O. Box 90, Glencoe, Illinois 60022).
JOY MARBURGER (Dept. of Biology, Bowling Green University, Bowling Green, Ohio 43404). "I became informed of your newsletter through a British professor and his wife who are also interested in obtaining the newsletter. They are currently completing a teaching contract in Sierra Leone, West Africa, where I also spent three years as a teacher. The three of us and several other biology teachers became interested in a particular family of tropical plants, the Dioncophyllaceae, which includes two of three genera which are found in Sierra Leone. One genus produces glandular leaves which Professor T. L. Green and Mrs. Green are investigating. I am also doing work on this family as research for my master's degree. The glands of one particular genus are thought to be insectivorous, so we are interested in gathering information concerning the nature of other carnivorous plants."
PETER MULLER (96 Forfar St., St. Albans, Christchurch-1, New Zealand). "I am 15 and I live in a two-story house in Christchurch. I built a plastic greenhouse and a year ago I got interested in carnivorous plants when a seed firm started to sell Venus-fly-traps. Although, small at first, they began to grow and grow. Then I read that the plants liked heat so I put the plants in an old fish bowl in sphagnum moss and covered them with plastic to trap the heat. But soon I found that the plants preferred the shade and that they grew much faster and were a much brighter green."
KEN NEWBEY (Ongerup, Western Australia 6336).
ROYCE BROWN (2949 Hewitt Ave., Apt. 395, Silver Spring, Md. 20906).
MARK ABBOTT (1420 177th Ave. N.E., Bellevue, Washington 98008).
GARETH M. FONG (789 Santa Ray Avenue, Oakland, California 94610).
RANDY SCHWARTZ (315 East 68th Street, 11A, New York, New York 10021).
LIBRARY RENE GIARD (2, Rue Royale, F. 59041, Lille Cedex, France).

CHANGE OF ADDRESS

ROBERT M. HAYNES (2631 Durant St., Apt. 208, Berkeley, Ca. 94704).
MARCEL LECOUFLE (5, Rue de Paris, Boissy-Saint-Leger, 94470, France).
JACQUES HALDI (9, Chemin des Poutets, 1212 Grand-Lancy, Geneve, Switzerland).
STEVE ROSE (125 Edward Street, Bedford Park, West Australia, 6052, Australia).
CHARLES KLINE (1404 San Ignacio, Solana Beach, California 92075).
TERRY L. LAUVER (3311 Chauncey Pl., Apt. 301, Mt. Rainier, Md. 20822).
LARRY LOGOTETA (22302 Center St., Apt. 17, Castro Valley, Ca. 94546).

NEWS AND VIEWS

C. F. MOORE has sad news regarding Sarracenia rubra jonesii in its native haunts in the North Carolina mountains--and haunt it may well be, for the plant is apparently doomed for ghosthood in herbariums. "The stations of S. jonesii are all taken over by golf courses and farming. A last one near Brevard has gone under. The species is almost extinct. Early in the spring, I made a trip through Henderson and Transylvania Counties. Where we had previously found plants, only one remained, this in Henderson County. One large estate where the plants had been found has been converted into a lake." Thus the few plants in living collections become even more important, and soon the perpetual discussion of the exact taxonomic position of this form or subspecies or species will become quite academic indeed. As Dr. Wherry has observed, the Sarracenias are particularly susceptible to the ecologic insults of man, and he has noted a precipitous fall in populations all over. "Progress" bulls onward.

BOB ZIEMER writes in to tell us that he received a reply from the publisher of Rica Erickson's book Plants of Prey, informing him that the book is out of print. If anyone knows where copies of this book still exist for purchase, please let us know. Since Lloyd's book Carnivorous Plants is also out of print, we are still looking for sources where this book may be purchased.

There is a three-page popular press release available from the Press Service, Cornell, Roberts Hall, Ithaca, NY 14850, summarizing some of STEPHEN WILLIAMS' work and entitled "Nerve-Like Signals in Plants."

STEVE CLEMESHA is sharing with us his technique of dividing and multiplying Sarracenia rhizomes: "If you can make a razor split on the rhizome of Sarracenia and leave it where it's growing, the front part of the plant will receive no set-back if it has 2-3 good roots or more. The rear piece will put up between one and five new shoots quickly. The method is safe if you check your frontpiece for roots before you cut it. I have never lost a plant this way. A cut with a sharp razor should be made behind the last pitcher (about 1/4 inch or a bit more behind it if it is long enough). Even very thin

rhizomes work if long enough to cut. The method is especially good for those rhizomes that produce very few offsets naturally as in the hybrid S. x mooreana. After cutting, it is best just to leave it until new shoots develop and then you are ready to repot."

Steve has also made some observations about the relative "appetites" of Sarracenias; he grows his outdoors. "As all my Sarracenias are outside all the time, I am in a good position to observe insect catching. I have noticed that some hybrids are poor insect catchers especially if they are a cross between a tall species and S. purpurea or S. psittacina. Now S. x areolata is an outstanding exception because it catches a lot of insects and seems to be more vigorous in this regard than either parent (S. leucophylla and S. alata). This is because the hybrid grows so freely that it has more pitchers in action through the greater number of crowns. On the other side, S. x catesbei (S. purpurea x S. flava) traps few insects and is about the worst of the lot. Observations on the species are interesting. S. oreophila seems to be the best. It catches a remarkable number of insects in a short time. Next in line are S. flava, alata, leucophylla and rubra which are all efficient catchers. S. minor is not too bad but noticeably slower than the above group. Darlingtonia comes next in line being a little worse but S. psittacina and S. purpurea are far worse insect catchers. Cephalotus is a pretty bad collector too, but the donkey prize must go to Heliamphora heterodoxa though my plants are not mature and may improve when larger. Perhaps it is not as bad as it looks as that split down the front of the pitcher could allow decayed bits of insect to get out."

Maybe the bugs are different in Australia. DON SCHNELL has noted in a mixed bog-tub outdoor collection that S. leucophylla is far and away the most avid and efficient trap, as grown in North Carolina. Often, the pitchers are nearly brimful after being open only a week. The next most attractive in that area would seem to be S. flava, which, by the way, seems to especially attract the pesty Japanese beetle. In fact, a tub or two of S. flava set between the rose bushes does wonders. S. alata ranks very close behind S. flava, and S. oreophila is clearly last among the erectae. We concur that S. x catesbei does not accomplish much. S. minor will quickly fill if there is a ready source of what seems almost to be a specific "prey"--ants. And, of course, S. psittacina relies mainly on flooding of its natural habitat to trap small water animals which can swim in but have difficulty negotiating the net of reversely pointed hairs.

It is seldom that we have an accurate record of a plant species being completely wiped out by a natural disaster, but JIM FORREST reviews "Whatever happened to Utricularia mairii?" "As most of you know, New Zealand is a land of many volcanoes, some dormant but many still active from time to time. The whole of our area here extending to the center of the island is volcanic with the usual geysers, boiling mud pools, frequent earthquakes, etc. White Island,

a few miles off the coast and just visible from Te Puke, is an active volcano which if it ever does a Krakatoa, will remove all of us around here in quick time. There used to be six species of Utricularia in our locality but one species was destroyed in the eruption of Mt. Taraivera in 1886. During three hours, the volcano opened a chasm nine miles long as a tear. Towards the end it opened under Lake Rotomahana and a tremendous explosion took place wiping out the famous pink and white terraces, the lake, and all plants in it. The whole countryside for some distance was showered with mud and rainstorms soon after, producing gutters in the mud which can be seen today. The Utricularia that was lost in this explosion was U. mairii, and to the best of my knowledge it has never been found there or in any other lake since. The species we still have are U. monanthos, lateriflora--both are also found in Australia, and the rest are endemic--protrusa, delicatula, novae-zelandiae, subsimilis, colensoi and vulcanica."

To add further to our list of commercial sources of CP, we might mention a place called the Tote Em in Zoo, Route 2, Box 368, Wilmington, NC 28401. Besides operating a small private zoo, the proprietors sell native CP at quite reasonable prices by the dozen or hundreds. A list is available.

JOE MAZRIMAS reports that at the San Francisco Flower and Garden Show held August 24-26 this past summer, five people displayed CP which were viewed by thousands of people. Unfortunately, the CP were judged in the same category as houseplants due to the lack of funds for establishing a separate category by the Show. Those with displays were: Larry Logoteta, Craig Gee, J. Mazrimas, James Payer and Raul Hernandez. A Darlingtonia grown by James Payer won third prize, while Craig Gee came up with second prize for a terrarium of Drosera and Sarracenia.

JACQUES HALDI has some suggestions for growing Drosophyllum: These directions come from the PALMENGARTEN of Frankfurt under the auspices of Madame Coester. (1) Fill an average size clay pot with peat that is slightly damp. Rotted pine soil can be used. (2) In order to activate germination, the seeds should be moistened with acid water before placing them on the pot and covering them lightly with a little peat. (3) When the young plants attain a height of 7-8 cm. (3 inches), then add a second pot filled with forest humus of pine under the first pot. The whole thing sits in a saucer of water. The forest humus should always be a little wetter than the peat. The saucer should be filled with water until the first pot becomes slightly moist. During the warm season, the plants can remain outside and in winter a pot for this species should be found that is about 10° C (50° F) with ample humidity, light and aeration.

And DAVID KUTT has some ideas about managing Darlingtonia: "In regards to growing Darlingtonia, I grow it in perlite and sphagnum peat with some live sphagnum moss on top. The biggest key to growing this species successfully is to grow it in the fall to spring season as opposed to the spring to fall period. This plant grows in

my window greenhouse in Ohio with daytime temperatures that reach 75°-85° F. in the day with average sunlight, and 40°-55° F. for a night average. I haven't checked yet, but maybe the earth's tilt during winter affects the climate in such a way as to simulate high altitude (mountain) growing conditions more closely than summer can. I keep my plant at about 40° F. in a plastic bag in the refrigerator during the summer. I am presently looking forward to an experiment in keeping the roots cold at all times even though surface air temperature could be 90° F. It is essential to keep the roots cool for good growth of this plant. My original concept is to use a styrofoam cooler and cut a hole in the lid to set the pot into. Then I will water with ice water and add more ice to the cooler in large chunks frozen in milk cartons. This version would require replacing the ice either daily or at least every other day. I think I would rather acquire a small used refrigerator unit to do the cooling. If it works, it should make it possible to grow Darlingtonia in a shady part of the greenhouse as long as humidity is high."

DAVE KUTT has another good suggestion: "For those plants that require dormancy, I wrap them up in plastic and store them in the refrigerator at 40° F. However, I have found that the plants will acquire a bad mold and eventually rot, especially Drosera and Pinguicula species. As far as I can tell, a lack of aeration seems to be the cause of the rot, and lack of light perhaps contributes to molds. I experimented last year with spraying barely damp peat with Lysol (a commercial disinfectant) and putting this loosely around the plants in a sealed container with some good results. My rot and mold problem was reduced, but I'm still looking for better ways to store the plants."

DAVID DuMOND has been studying the elusive little Utricularia olivacea in eastern North Carolina. This little aquatic boasts a flower of 2-3 mm. and a finely branching network that can be spotted only with difficulty among other floating plants. He would like to know if anyone has come across any further publications on the plant since the one concerning ecology in Vol. 84 (#4) of the J. Elisha Mit. Soc. In spite of local depredations due to "development", he finds the plant locally abundant in remaining sandy depressions and sinks, with about one-third of the 300 or so such sinks in two southeastern counties having the plant. He feels that U. olivacea may depend on the occurrence of U. purpurea (possibly for floatation) with which it is a very frequent associate. In aquarium culture as well as in nature, the flower opens even though submerged, leading to interesting questions about possible aquatic pollen vectors. David says he would be happy to direct researchers to locations, but would like to keep collections from being massive--which is certainly understandable. (c/o Dept. of Botany, N.C. State University, Raleigh, North Carolina 27607).

One of the short notes in this issue by JOE MAZRIMAS concerns his efforts to battle the greenhouse denizens that attack carnivorous plants, a sort of retribution as an anthropomorphically oriented

friend comments. LEO SONG has also been battling: "At one time, mealy bug posed a problem as well as infestation by scale. I tried Cygon 2E at the rate of 1 tsp/gal on Sarracenia, Drosera, Byblis, and Darlingtonia. The spray solution also hit some Pinguiculas growing along with the Droseras as well as Dionaeas. In D. capensis and D. binata (simple form) there was severe leaf deformation with the apparent death of the apical meristem of the former. All growth on D. capensis ceased with the eventual death of the plant. Leaves on D. binata continue to come out deformed, in some cases not unrolling entirely. The inflorescences are also deformed. In some plants, the appearance of these symptoms was delayed for about a month. Deformed leaves were also noted in Dionaea, Sarracenia--symptoms less severe-seem to be recovering, Pinguiculas--resulted in severe deformation of the center portion and eventual death, and Byblis gigantea--leaves and center portion swollen and twisted--seems to be holding its own--all axillary buds seem to be likewise affected. I would like to know if anyone has had a similar experience with this or any other pesticide."

DON SCHNELL claims some success without having to spray at all. He has found that Vapona strips (e.g., Shell No-Pest Strips) hung about the greenhouse conclusively eliminated scale, mealy bug, aphids, white fly, and reduced red spider mite. The trick is to use about four times as many strips as instructions recommend. He selected one of his greenhouses measuring 10 x 20 ft. as a test since in addition to CP, it also contains orchids, ferns and bromeliads. Four strips were hung about the place and changed every three months as recommended. There was absolutely no harm to any plants or people entering the greenhouse. Of course, in the daytime (especially in summer), the vents are operating, but they close at night and then the vapors apparently build up to do their work. He used to spray regularly with Malathion, the safest all-around spray for CP (used diluted more than instructions say) and this works well, but for the past year and a half, spraying has been obviated by Vapona, even though new introductions to the greenhouse (likely infected) continued.

Continuing the saga of Heliamphora heterodoxa in culture, Don also reports that the ripening seed capsules reported in the last issue did indeed yield a small quantity of viable seed along with a lot of air in the capsule. The small quantity of seed is undoubtedly related to the low pollen fertility level previously discussed. Anyway, the seed germinated promptly on a sandy-peat mix in full sunlight with about half a dozen seedlings surviving damping off and standing 1 cm. tall now. Attempts at germination of portions of the seed on Sphagnum and after stratification reduced seed viability markedly. Unlike the U.S. members of the family, Heliamphora seed apparently do not require a period of moist, cold dormancy.

Mr. YASUSHI SATO (Gifu, Japan) noted that his plant of Utricularia tricolor flowered in late August, 1973. According to Peter Taylor's note (CPN Vol. II(3), p. 34), Royal Botanic Gardens at Kew cultivates U. tricolor but it never flowers. It seems that vegetative growth

is abundant but cultural environments are not right for flowering. He cultivates it in sphagnum moss with ground water: 17-18° C., pH slightly acid. Many scapes were formed simultaneously, but most of the flower buds did not bloom and there was only one flower. The corolla was 8 mm. long and 6-7 mm. wide, pale pinkish-purple with a yellow spot in the center.

SHORT NOTES

HABITAT OF DROSERA PELTATA
by B. Whitehead

In an effort to cultivate Drosera peltata more successfully, I have made observation trips to large concentrations of the species in the Nowra and Jervis Bay districts, both on the south coast of N.S.W. The areas visited were typical habitats for the species in this area, and in one spot plants were so frequent that it was impossible to avoid treading on them while walking. It was hoped that a study of their habitat might provide some useful information, and the description follows for those who might be able to make some use of the information.

Yalwal Road, NOWRA: The area supporting the Drosera peltata population here was a flat sandstone shelf sloping gently for about 100 meters down to a creek. In many places, bare rock was visible, in others, moss had covered the rock and beyond the mossy area shallow soil supported a population of heath plants which ranged between 50-150 cm. in height. Surrounding the area was dryish bush-land with much larger shrubs and Eucalyptus trees of different species to a height of 10 meters. Drosera peltata occurred only in the low heath and in the moss. The moisture content of these areas was extremely variable, the only constant factor being that areas where they were to be found would receive more water than the surrounding areas, and appreciably more light, in some cases, full sun. Depth of the tubers in the moss ranged between 2-5 cm., usually the complete depth of the moss with the tuber setting on the rock underneath. Water was seeping through the moss so that it continually held much water, as opposed to being damp. Plants of Drosera peltata were found just as commonly in the heath. Tuber depth was about the same, despite the rock being comparatively much deeper and the soil only damp. The areas were inspected in winter, in the plants' growing season. The dormant tubers in summer would be subjected to both very dry and very wet periods, and quite a bit of heat. The other carnivorous plants in this area were Drosera pygmaea. Drosera binata would also probably be evident in summer.

JERVIS BAY: The flat tops of hills where sandstone comes very close to the surface and causes water to seep constantly on the slightly lower levels provide, in these lower levels, predictably suitable habitats. The story was the same here as above, except that moss was not so common. Plants were absent from the white sand areas, but abundant in the sandy mud lower down. Here they had little competition from other plants as the ground had been burnt some months ago and the sundews were present in their thousands, some already in flower. Associated carnivorous plants were Drosera pygmaea,

spathulata, and Utricularia lateriflora.

Drosera peltata has red, fairly hard tubers which are renewed annually. Some plants inspected had a small thick "root" extending below the tuber, and I can only assume that, as with some terrestrial orchids, young Drosera peltata plants produce a deeper tuber each season for one or more seasons until a suitable depth is reached. What determines a suitable depth is difficult to determine.

As for cultivation of the species, my best but very limited success has been with the plants growing in sphagnum moss, pots stood in shallow water. Self-sown plants appear to be more reliable, and for this reason it might be better to start this species off from seed, either in fairly well-packed sphagnum or sandy soil.

OBSERVATIONS ON TUBEROUS DROSERAS
by Richard Sivertsen

I've had dropper root formation with Drosera peltata in pure sphagnum moss, sand-peat mixtures and sand-loam. The important factor is not necessarily the medium, as long as it is slightly acid, but kept just moist to damp, and as cool as possible--preferably 40° F. at night to 65-70° F. in the day. Humidity doesn't seem to be too critical as there were weeks when it varied between 25-35% and sometimes lower. The most critical stage in its growth is during the first four to six weeks of new seasonal growth from the tuber. It should be kept only damp, and drying it out will not harm it at this time because the plant is being fed from the tuber, both water and nutrients.

In nature, the Australian winters begin with light rains so that it takes time for the hard and crusty-dry baked sandy soil to become moist again. When the tubers are just starting new seasonal growth and they are exposed to overwetness, the tuber can't shrink down, as it is supposed to for a brief period, and it can't cope with this premature excess moisture so that it eventually rots. So as the young growth continues, the tuber is the only source of water and nutrients for the first four weeks. As the plant matures, the original tuber shrinks slowly and then forms thick dropper roots along with thinner roots used to absorb water. I usually peek to check on its progress, carefully. The original tuber may or may not disappear altogether, sometimes reduced to a swollen portion of the stem underground. Then more moisture can be applied and as the plant ends its growing cycle after flowering, the original tuber will start to swell up again. This is followed by formation of the dropper roots with thickened knobs at their tips which will ripen into tubers within another four to six weeks depending on the species. The soil is gradually drying until the surface growth has withered. Then it is safe to poke around to see if the tuber is fully swollen again and has shed its roots. It can be dug up and stored in a warm place wrapped in cheese cloth without any soil.

TUBEROUS DROSERAS IN SOUTH AUSTRALIA

by Ray C. Nash

I read with some little amusement the comments in Vol. I, No. 4 of CPN on the subject of our Australian tuberous Droseras. These CP's are the only species I have had any success with, other than a hybrid Sarracenia, S. flava, Utricularia dichotoma, and U. gibba ssp. exoleta.

In reality my success extends only to those species native to South Australia, plants from Western Australia have been tried but these eventually fade away. The wet-dry condition is an essential must. Winter is the time that the majority of our rain falls, although several inches may fall during summer showers. The summer can be long and dry; in fact, the evaporation rate is higher than the annual rainfall.

During the winter, the soil in which D. peltata, D. glanduligera, D. whittakerii (Mt. Lofty Ranges type), D. stricticaulis and often D. auriculata grow can often have water covering the surface. In summer, these same lands will be dry and dusty. D. whittakerii var. praefolia will often push through very parched soil to flower, followed a few weeks later by the first heavy winter rains. If these plants do not show in early April, then it is a good sign of a drought winter. I would suggest that intending growers make up a very loose compost, composed of coarse washed river sand to a mesh size of about 2-3 mm. Into the sand is mixed about one part of humus material to each five parts of sand. The humus material can consist of a Eucalyptus sawdust, German peat or rotten and aged pine sawdust.

The tubers are planted five diameters below the surface and spaced an equal distance apart. The "dropper root" is used by young plants or plants planted too shallow and are just getting the tubers down to a safe depth. Many of our tuberous Drosera stay at one depth for their whole lifetime or until the soil is disturbed. When these plants are removed from the soil, in the bushland, the tuber will be found to be covered with a thick layer of old tuber fiber.

The method described in allowing these plants to go dormant is correct, but the dry time can extend from 3-5 months. Normally, these plants dry off in early November (the beginning of our summer) and reappear in late April to June. During this time the pots should be kept cool and shaded and not watered except for a little natural rain. Once growth is evident, then the compost should at first be kept just moist and as the plants develop, the amount of water may be slowly increased. It may be necessary to place the pots in a small saucer which will hold up to half an inch of water. Once the flowers have finished, the compost should be allowed to slowly dry out. As the plants start to die back, stop all watering and prepare them for the summer sleep. The dry period is essential.

During the summer, shade temperatures can get as high as 40° C. (110°F.)

with the average of about 30°C. (86°F.). In winter, the air temperature will fall as low as 0°C. (32°F.) during the early mornings, but averages about 5°C. (40°F.). The average winter daytime temperature goes to 15°C. (60°F.). The plants do like misty or foggy conditions in the early morning followed by mild sun; this seems to stimulate the glands on the hairs.

Several species do not object to being alone in a pot, but I find that D. planchonii grows best if planted with differing species, in my case it is grown with our native terrestrial orchids. D. glanduligera is grown with mixed native grasses and other small plants, in a very sandy compost. D. stricticaulis is grown under mild swamp (bog) conditions along with native Crassula.

All species, other than D. glanduligera, take several years to reach the flowering stage when grown from seed. I do not recommend splitting the tubers up, but if this method is tried, then I would suggest a system that has been used on native terrestrial orchid tubers. In this method, the tuber is split through the eye (the shoot) and each part is quickly sealed with wax. Another method is to remove the tuber from the stem just as the plants break surface. The stem will grow a new tuber and the tuber will produce another stem. Leaf cuttings may also be used to increase the number of plants.

THE SPECIES

Drosera whittakerii (eastern form): occurs in southeastern part of S.A. giving away to the Mt. Lofty Ranges form a few miles east of the River Marray. Also found in Victoria. This plant can often be found in large colonies, some quite thick with the plants making a carpet upon the ground. This form reproduces mainly vegetatively by lateral underground stems produced from the main stem just below ground level. If these lateral stems grow above the ground, then small leaflets can be produced complete with hairs and glands. Generally, these plants have few flowers.

Drosera whittakerii (Mt. Lofty Ranges form): abundant throughout the before mentioned ranges. A much larger plant than the eastern form, producing many flowers often on branching stems. Does not often reproduce vegetatively, seemingly relying mostly upon seed, does oft times produce very small open colonies.

Drosera whittakerii var. praefolia: confined to a very restricted part of the Mt. Lofty Ranges, within a radius of 5 miles of the small township of Clavendon, about 16 miles south of Adelaide. This plant has not been included in any conservation reserve, although the author is always trying. To this time, I have not had or seen any member of this variety reproduce vegetatively but it too does form small compact groups. This plant produces abundant flowers, one plant in 1973, grown by the author, had 25 flowers. It does produce abundant seed and many seedlings are to be found about the adult plants. The stem will often branch, usually below ground level which gives the appearance of several plants as each stem forms a separate rosette of leaves.

Drosera peltata: Mt. Lofty Ranges, Flindess Ranges and into eastern Australia. Does not appear to reproduce vegetatively but produces abundant seed. Often great masses of this plant may be seen in paddocks (fields) that have not been ploughed or have not been so treated for 50 or so years.

Drosera auriculata: found in some areas as the above but can stand drier conditions. Both grow in swampland (bogs) but this does not mean to say they will survive under such conditions in cultivation. I think the swamp growing plants only survive to flower. This plant will multiply very slowly vegetatively but most new plants are produced from seed, which is often quite abundant.

Drosera stricticaulis: confined, as yet, to one collection from Eyre Peninsula not a great distance from Port Lincoln. The South Australian plant is smaller than those found in Western Australia. This species reproduces vegetatively and makes only a small amount of seed from each flower.

Drosera planchonii: found throughout the better watered areas of this arid state of Australia. The tubers are usually buried deep in the soil and in the case of sandy soil, very deep. It would appear that seed is the only method used to multiply this species and each flower can produce quite a large amount. This plant has a long, thin stem and is often termed a climbing form, although I think clinging would be a better term as the sticky glands adhere to other plants thus supporting the stem and large white flowers.

Drosera glanduligera: a plant of specialized habitat, usually growing only in a very damp sandy soil or damp soils in open areas but is found over a wide area in the damper parts of the state. This plant reproduces only from seed and has the reputation of being an annual. However, I have found that if the plants do not flower then a very small white tuber is formed, so that the plant can last through the summer to grow and perhaps flower the following winter. The seed can take up to two years to germinate.

Generally, all of the above plants like a little direct morning sunlight, when they have first been watered. I use the rosetted species as natural flytraps amongst my native terrestrial orchids to catch small insect pests.

At this point I would ask you not to write asking for plants or seed as collecting both is very time consuming and I have already overcommitted myself in these matters for some time. Until I have satisfied those I have already promised plants and seed, I must say sorry to any more requests.

KEY TO THE NORTH AMERICAN SPECIES OF UTRICULARIA (BLADDERWORTS)

by Katsuhiko Kondo

A. Flower pinkish-purple

B. Plant aquatic; Lateral lobes of the lower lip of corolla saccate; Bracts peltate .....1. Utricularia purpurea

B. Plant terrestrial; Lateral lobes of the lower lip of corolla not saccate; Bracts tubular.....2. Utricularia resupinata

A. Flower yellow (yellow in chasmogamous flower; yellow or yellowish-white in cleistogamous flower)

C. Scales, bracts, bracteoles, and calyx-lobes all fimbriate .....3. Utricularia fimbriata

C. Scales, bracts, bracteoles, and calyx-lobes not fimbriate

D. Pedicel with one bract and two bracteoles at base

E. Pedicels longer than the bracts; One bract and two bracteoles associated with each other at base .....4. Utricularia standleyae

E. Pedicels mostly as long as the bracts; One bract and two bracteoles each separatedat base

F. Scapes green to yellowish-green; Nodes mostly 6-14; Only chasmogamous flower present; Upper lip mostly 9.1-12.8 mm long; Lower lip mostly 5.6-11.9 mm high; Spur mostly 7.5-13.8 mm long .....5. Utricularia cornuta

F. Scapes greenish-purple to purple; Nodes mostly 4-32; Both chasmogamous flower and cleistogamous flower present; Upper lip of chasmogamous flower mostly 6.0-8.6 mm long; Lower lip mostly 2.6-5.2 mm high; Spur mostly 4.6-6.5 mm long; Upper lip of cleistogamous flowers mostly 1.9-3.1 mm long; Lower lip mostly 0.8-1.4 mm high; Spur mostly 0.7-2.4 mm long .....6. Utricularia juncea

D. Pedicel with one bract at base, and no bracteole

G. Bracts and scales peltate; Rachis zigzag when more than two flowered.....7. Utricularia subulata

G. Bracts and scales not peltate, attached by base; Rachis not zigzag

H. Ovules two, seed one per capsule... 8. Utricularia olivacea

H. Ovules and seeds per capsule numerous

I. Scapes with floats of inflated petioles

J. Racemes 4-17 flowered, mostly 9-14; Spur notched at tip; Bracts longer than broad, never lobed; Chromosome number n = 9 or 18
.....9. Utricularia inflata

J. Racemes 1-7 flowered, mostly 3-4; Spur never notched at tip; Bracts as broad as long or broader, variable with respect to lobing; Chromosome number n = 14
.....10. Utricularia radiata

I. Scapes without floats of inflated petioles

K. Pedicels arched-recurving in fruits; Flowers 6-20 per scape

L. Spur hook-like; Peduncles below the lowest bract, bearing 1-few widely scattered bract-like scales.....11. Utricularia australis (I)

L. Spur not hook-like; Peduncles without scales below the bracts; Cleistogamous flower without lips present .....12. Utricularia geminiscapa

K. Pedicels ascending in fruits; Flowers 6 or fewer per scape

M. Plant free floating with subterranean branches without foliar unit, only bladders present

N. Pyramiddal spur, positioned at a right angle to the lower lip
.....13. Utricularia ochroleuca

N. Cylindrical spur, positioned at an acute angle to the lower lip
14. Utricularia intermedia

M. Plant forming mats in shallow water, subterranean branches absent

O. Lower lip about twice as long as the upper lip; Bracts purple auriculate; Spur less than 1/2 the length of the lower lip, saccate.....15. Utricularia minor

O. Lower lip equalling the upper lip, upper lip not lobed; Bracts not purple, semi-amplexicaulous; Spur almost as long as the lower lip

P. Lower lip 5-6 mm long.....16. Utricularia gibba (II)

P. Lower lip 8-10 mm long

Q. Scapes 10-40 cm tall;

R. Scapes erect; Corolla 15-20 mm wide
.....17. Utricularia fibrosa (II)

R. Scapes flexuous; Corolla 12-15 mm wide
.....18. Utricularia floridana(II)

Q. Scapes 5-12 cm tall.....19. Utricularia biflora (II) (III)

(I). Utricularia australis includes U. macrorhiza and U. vulgaris which are synonyms (see Peter Taylor. Bull. Jard. Bot. Nat. Belg. 41: 269-272. 1971).

(II).Since Utricularia fibrosa, U. biflora, U. gibba, and U. floridana form a complex, it should be careful to key out them.

(III). Utricularia biflora includes U. pumila which is a synonym now.

GLOSSARY :

Cleistogamous flower = A type of self-pollinated flower that does not open

Chasmogamous flower = A normal open flower

Explanation of the figure

A. Tubular bract of Utricularia resupinata

B. Side view of corolla with horizontal spur of Utricularia resupinata

C. Peltate bract of Utricularia purpurea

D. Flower of Utricularia purpurea with saccate-shaped lower lip of corolla

E. Flower of Utricularia fimbriata: calyx and a pair of bractlets are present; scales, bracts, bracteoles, and calyx-lobes are all fimbriate forms

F. Scale of Utricularia cornuta and U. juncea

G. Pedicel with a bract and two bracteoles at base in Utricularia cornuta and U. juncea

H. Scale of Utricularia standleyae

I. Pedicel with a bract and two bracteoles at base in Utricularia standleyae

J. Peltate bract of Utricularia subulata

K. Flower of Utricularia subulata

L. Bract of Utricularia gibba

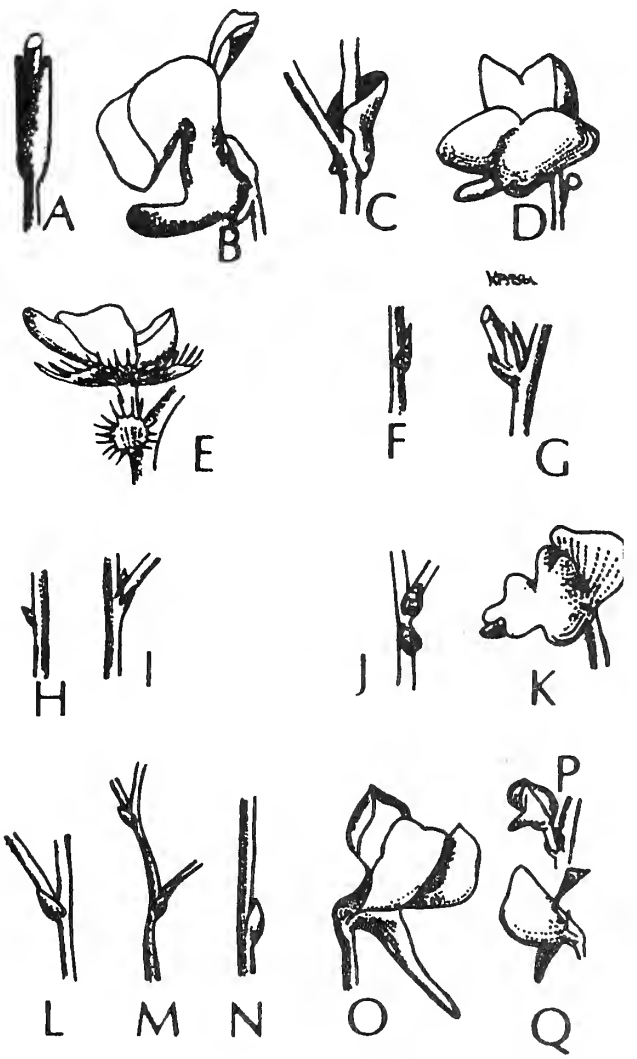
M. Bracts of Utricularia inflata

N. Scale of Utricularia fibrosa

O. Flower of Utricularia cornuta

P. Cleistogamous flower of Utricularia juncea

Q. Chasmogamous flower of Utricularia juncea



IN SEARCH OF DROSERA ANGLICA

by Robert R. Ziemer

In mid-April we piled into the car to visit the Darlingtonia and Pinguicula vulgaris at Gasquet, California. After a couple of enjoyable hours walking among the vast stands of flowering cobra lilies and butterworts in the warm spring sun we continued up highway 299 through Grant's Pass to Medford, Oregon. Then along highway 140 toward Klamath Falls to Lake-of-the-Woods. As we neared the lake, a feeling of disappointment began to bud and in another ten minutes was in full bloom--for along the highway was two feet of snow and this was only at an elevation of 5000 feet. Bull Swamp was six miles and 1000 feet in elevation away. The snow pack there would be at least six feet deep. THWARTED AGAIN!

At the end of June I tried again. This time the only snow seen was on the mountain peaks above 8000 feet--well above Bull Swamp. The six miles of Forest Service dirt road to Fourmile Lake was well traveled by campers and fishermen by now. The setting of Bull Swamp is quite pretty--a subalpine bog of about 80 acres among spruce and fir at the eastern base of Mt. McLoughlin, a 9500-foot volcanic cone. The region is dotted with recent lava flows, predominantly on the northern and western slopes of Mt. McLoughlin. Bull Swamp lies in a saddle between two volcanic cones. Within a six square mile area 17 lakes and numerous ponds can be found, some of which are quite large, such as 1000-acre Fourmile Lake. Others are less than one acre in area. A few places, like Bull Swamp, have filled with organic material over the years to produce a bog. This late in June one could probably walk all over Bull Swamp without getting wet beyond the knees--I didn't try, however. Mostly the bog is three inches or so deep. Around the edges fir and spruce trees have fallen into the swamp. These and numerous hummocks of bunch grass provide a dry access for those disliking goo around the toes.

Drosera anglica abound, growing in all moist areas where water at this time of the year was less than about two inches deep and continuing up to perhaps one inch above the water line, forming a reddish-green carpet. Many Drosera thus were submerged by two inches but thriving nevertheless. Beyond about one inch above the water line the Drosera faded out and grasses and more hardy herbs increased. Co-habitating the zone occupied by Drosera anglica from about one-fourth inch above water, but extending to the deepest depths I saw (about 12 inches) was Utricularia intermedia. This species completed the visual carpet effect. No other species of Drosera or Utricularia could be found, though I searched the bog extensively. In other locations Drosera anglica is often found growing among D. rotundifolia. The D. anglica found in such areas is often genetically "contaminated" by the D. rotundifolia. In Bull Swamp D. anglica has been isolated from other Drosera species for some time. Don Schnell has observed these specimens appear different from his D. anglica in that "the 'paddle' of the leaf is much larger, almost approaching D. linearis in size."

The substratum of Bull Swamp is a gooey, smelly muck in which a large number of small fresh water clams (about 2 mm. in size) and isopods can be found. Thus the muck, though smelly, is very much alive, providing a veritable feast for the Utricularia. All sub-alpine bogs support large numbers of mosquitoes and gnats, and Bull Swamp is no exception. Most of the Drosera leaves were covered with such flying beasties. Unfortunately, there were enough left to feed on the carnivorologists. The water felt rather warm on the surface, but one inch into the muck was quite cold. Freshets of clear cold water could be found throughout the swamp and the water seemed to be far from stagnant. Thus, Bull Swamp is an interesting place, deserving far more than this short two-hour visit.

BUGS! BUGS! BUGS!

by J. A. Mazrimas

This is a rather embarrassing subject to discuss in this newsletter especially when you consider the type of plants that becomes affected. Nevertheless, at one time or another, insects will suddenly explode in numbers resulting in many of our carnivorous plants being overwhelmed by them. Prevention is, of course, the key to keeping plants free from insects and healthy besides. This means cleanliness in the use of pots, utensils and removal of all debris and dead matter from the area of the collection. Secondly, I would be cautious in introducing any new plant into the main collection. The new plant should be grown for a while in an isolated area even though you received it from a good friend or even a commercial grower. But if trouble does strike, these are some of the things that I would do: first, I would try washing off the bugs with water from either a hose or from a trigger-type sprayer set for a heavy spray. This should be repeated about three or four times in two-to three-day intervals. Usually aphids are easily swept off the plant by this method. Sometimes, the white cottony mealy bug can also be removed by this method. If this doesn't work, then both mealy bugs and scale insects can be treated with a Q-tip dipped in rubbing alcohol provided that the infestation is not too large. As a last resort, I would use the pesticide Malathion at the recommended dosage stated on the bottle. I spray only the infected portion of the plant and repeat this about a week later. Sphagnum moss (live) is killed by this material and Pinguicula leaves are especially sensitive to it also. So I remove the excess chemical after fifteen minutes with copious amounts of fresh water. Scale insects are particularly difficult to kill because of the hard waxy coating that protects them. They seem to hide in the small crevices of many pitcher plants such as Sarracenia and where the lamina joins the stem in Nepenthes. So I gently use an old toothbrush dipped in the Malathion solution to dig these out. These three pests, aphids, mealy bugs and scale, are the most common invaders of a collection. So far, I haven't yet been bothered by spider mite probably because this mite detests the high moisture associated with these plants.

SPECIAL NOTICES

LAST REMINDER--Yearly subscriptions end with this issue!! So, if you wish to receive CPN in continuity, please send in your renewal by the end of January. We will probably not be able to honor any renewals in large numbers after that date since subscription is by the volume, and the size of the first issue printing will be based on renewals received by the end of January, plus a small allowance reserved for new subscribers. Please note the increase in subscription rates as listed in the last issue of CPN.

VINCENT BELLIS (Dept. of Biology, East Carolina University, Greenville, N. C. 27834) is attempting to organize a new survey of the Dionaea range in the Carolinas. This will be done in order to determine the extent of shrinkage of the range, and there will be rechecking of locations previously listed. This will take some interested manpower and the survey is tentatively planned for next spring. So all of you Carolinians and others close by who are interested, drop Vincent a note.

RECENT LITERATURE

Dexheimer, Jean: Some ultrastructural aspects of mucilage secretion by the digestive glands of Drosera rotundifolia. CR Hebd. Seances. Acad. Sci. Ser. D. Sci. Nat. 275 (18): 1983-1986 1972

The author describes in detail, on the cellular level, that the secretion of mucilage is discontinuous in the digestive glands. In one gland, there are cells found in all stages (rest, accumulation, vesicular expulsion) and all can be observed easily.

Hansen, C.: Note on Drosera rotundifolia L. in Greenland. Botanisk Tidsskrift 67: 342-343 1973

Distribution of Drosera rotundifolia in Greenland was well discussed with a fine mapping. Also, the chromosome number of the species was listed as 2n=20.

Jaffe, M. J.: The role of ATP in mechanically stimulated rapid closure of the Venus's fly trap. Plant Physiol. 51 (1): 17-18 1973

When the midribs of untreated traps of Dionaea are frozen in liquid nitrogen after rapid closure, they contain significantly less ATP than those before closure. Exogenous ATP causes a significant increase in the rate of closure. Illuminated traps close faster than those in the dark. The traps of plants placed in 100% oxygen close much faster than do air controls, while 100% carbon dioxide inhibits closure. It is concluded that ATP is probably the native source of potential energy for contraction.

Khan, Reayat: Lentibulariaceae: in the Proceeding of the symposium of comparative embryology of Angiosperm. Bull. Indian Nat. Sci. Acad. 41: 290-297 1970
Lentibulariaceae embryology is reviewed. The embryological data show that the Lentibulariaceae is placed near the Scrophulariaceae.

Kocan, Alan: Carnivorous plants. Wildlife in North Carolina 37: 14-15 1973
A popular article featuring color photos representing each genus of CP found in North Carolina.

Kondo, K.: The chromosome number of Utricularia denticulata Benjamin. Ann. Mo. Bot. Gard. 59: 474-476 1972
Taylor reduced this species to a synonym of U. livida. Specimens obtained originally from Mexico disclosed n=18. This is consistent with the author's previous contention that x=9 is found only in the New World species.

Kondo, K.: Chromosome numbers of some Drosera taxa. J. Jap. Bot. 48: 193-198 1973
Reported were: D. menziesii, 2n=26; D. peltata (Australian origin), n=16 (differs with previous counts on plants from other countries); D. spathulata (Kansai type), 2n=60; and a hybrid, D. x 'Nagamoto'(D. longifolia x D. spathulata Kansai) exhibited two discrepant counts, 2n=50 (expected theoretically) and 2n=43, the latter possibly due to meiotic irregularity.

Maier, R.: Das Austreiben der Turionen von Utricularia vulgaris L. nach verschieden langen Perioden der Austrocknung Mit 5 Abbildungen. Flora 162: 269-283 1973
This is a physiological observation of the sprouting of turions of Utricularia vulgaris after different periods of drying. It is particularly characteristic for Utricularia vulgaris to form turions under unfavourable growing conditions, and this fact already shows that both stadium-the well developed plant and the turions-are of different ecophysiological meaning. Differences appear in the total water content of both habits. The relative water content of the turions is lowered by stored assimilates.

Mel'nyk, S.D.: One more occurrence of Aldrovanda vesiculosa L. in the Ukraine. Ukr. Bot. Zh 29(3): 381-383 1972 IN RUSSIAN
This species was found in the region of Lake Shatskie in the Ukranian SSR for the first time.

Rao, A.N. & E.T.: Ong. Germination of compound pollen grains. Grana 12(2): 113-120 1972
Among the many species of pollen grains that germinated in a sucrose media of 10-30% was that of Nepenthes ampullaria. The authors found that the size of the pollen grain and its internal osmotic pressure were two important parameters for successful germination rate.

Roberts, Patricia R. and Oosting, H.J.: Responses of Venus' Fly Trap (Dionaea muscipula) to factors involved in its endemism. Ecol. Monogr. 28(2): 193-218 1958

A very comprehensive paper covering many aspects of Dionaea from the most recent determination of its range, phenology and ecology as well as a review of some of the literature.

Taylor, P.A.: A new combination in Genlisea. Kew Bull. 26(3): 444 1972

Genlisea hispidula Stapf ssp. subglabra is proposed for that part of the geographic range occupied by G. hispidula retaining the species outside of this range.

Taylor, P.A.: A new species of Utricularia (Lentibulariaceae) from Rwanda and Burundi and notes on several species of Utricularia occurring in the area of the Flore du Congo, du Rwanda et du Burundi. Bull Jard. Bot. Nat. Belg. 41: 269-272 1971

As a new species, Utricularia troupinii, which grows in Rwanda and Burundi, was described for the first time. Utricularia microcalyx (P. Taylor) P. Taylor was described as a new combination. Utricularia neglecta, U. incerta, U. stellaris, and U. vulgaris were placed under U. australis R. Br. as synonyms.

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